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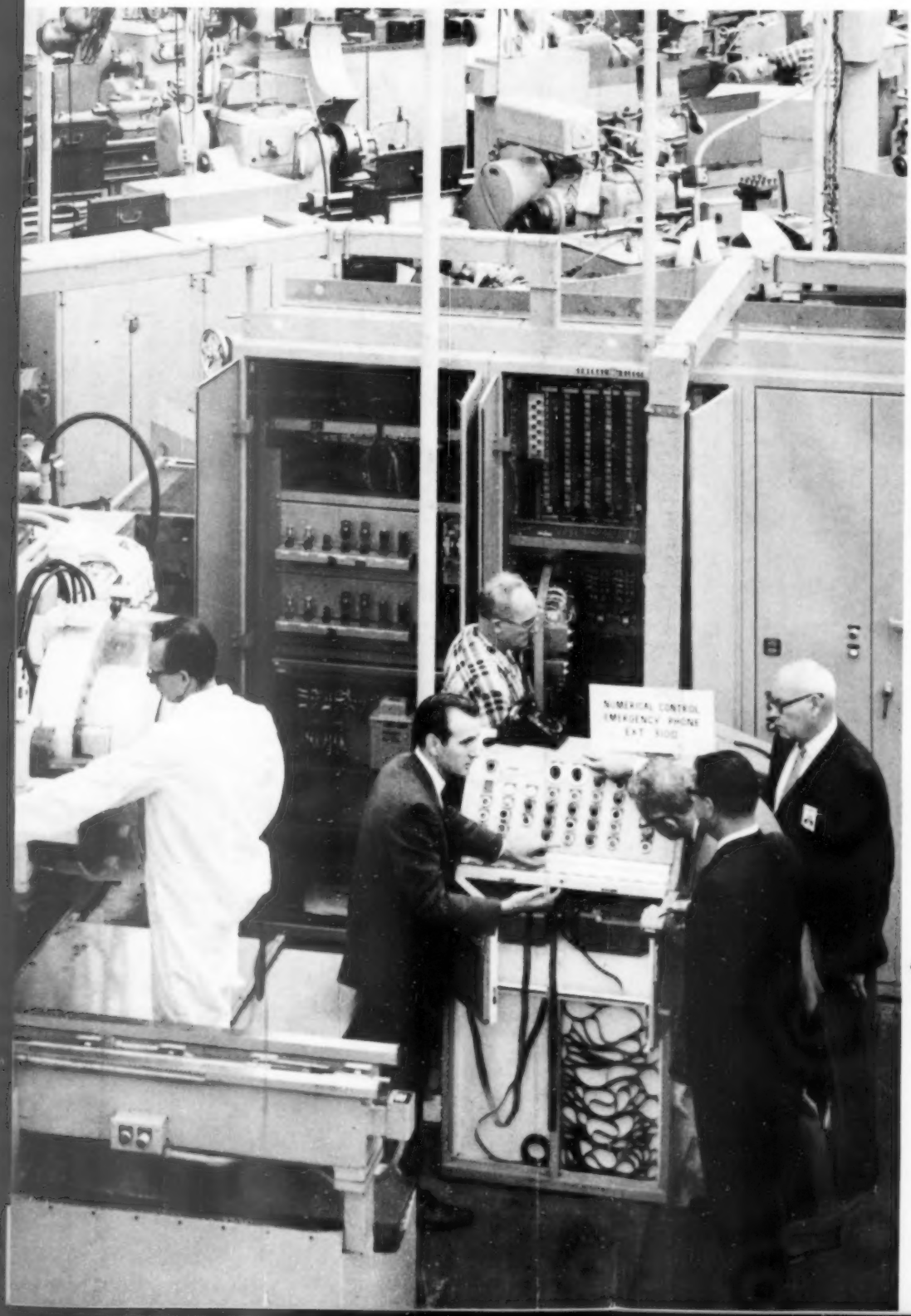
BETTER MANAGEMENT
OF
PLANT OPERATIONS

FACTORY

september 1961

PRICE ONE DOLLAR

A McGRAW-HILL PUBLICATION



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p. 240

COVER STORY
ZEROING IN ON ZERO DOWNTIME
p. 112

NEW Butterfly Valve!

MATCHLESS LUNKENHEIMER QUALITY

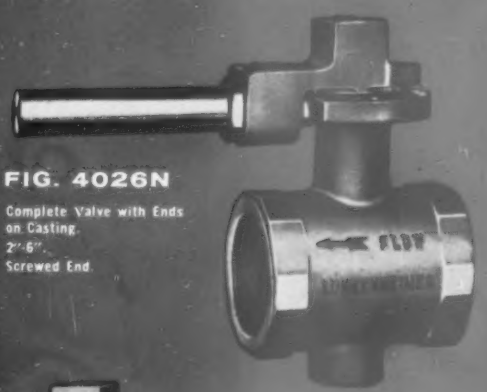

FIG. 4026N

Complete Valve with Ends on Casting. 2"-6". Screwed End.

FIG. 4150N

(Rubber-Lined: Fig. 4151R) Valve Elements Only. 2"-18". Screwed, Welded, Grooved, or Flanged Ends Supplied Separately to Fit Your Pipe Connections

W. P. 150 psi.

- QUICK OPENING
- POSITIVE CLOSURE
- NICKEL-PLATED CAST IRON
- STAINLESS STEEL TRIM
- "O" RING SEALS

New Lunkenheimer Butterfly Valves are compact and lightweight, easy to install on any line in a fraction of the space required by standard gate or plug valves. A quarter-turn of the stem opens the disc full or closes it tight. No lubrication is required, and "O" Ring seals provide positive shut-off in either vacuum or pressure service. These new Butterfly Valves are made to traditional Lunkenheimer standards of quality. WRITE for new Catalog 613 or call your Lunkenheimer distributor today for full information on the new Lunkenheimer Butterfly Valve line . . . available now for immediate delivery.

L-1811-B

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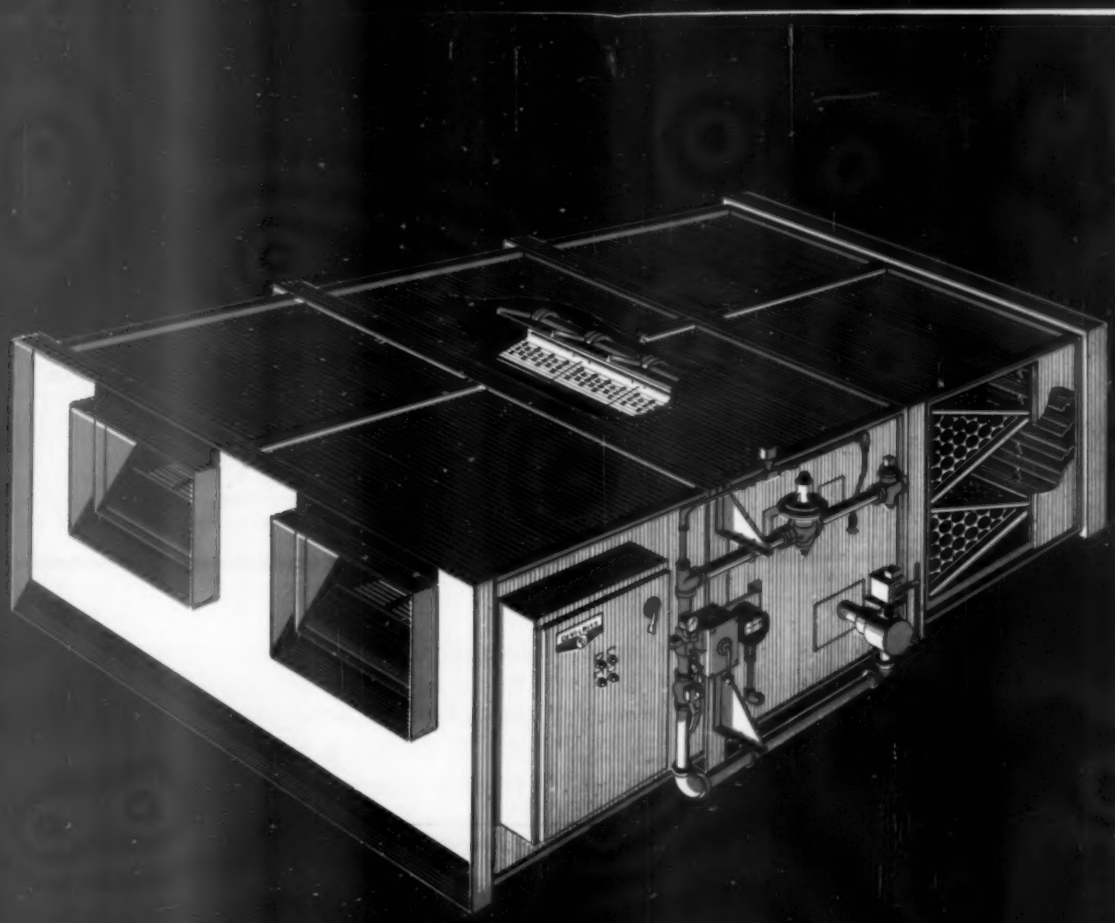
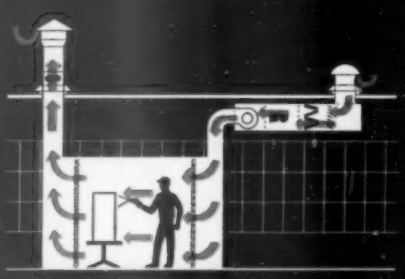
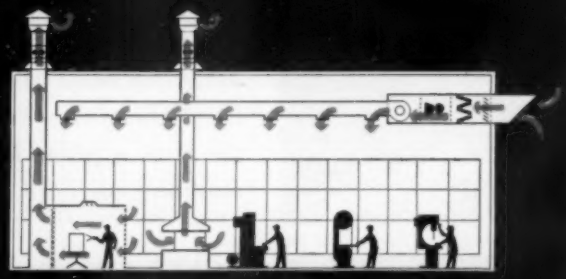




AIR-REPLACEMENT UNIT PROVIDES DUST AND TEMPERATURE CONTROL FOR TOTALLY ENCLOSED SPRAY BOOTH.



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SEPTEMBER 1961

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COMING

In October read the picture-packed review of European and Far Eastern personnel practices. How are foreign workers treated? Better than you may think. In fact, industries in such countries as Germany, France, and Japan provide benefits that would raise eyebrows in the U.S. **In November** FACTORY scores another first with its special issue on indirect costs. It'll be jam-packed with tips on how to lower them.

COVER

This maintenance-management team, which has produced a record low in downtime with a stable of numerically controlled tools, is inspecting a control unit at Rocketdyne's plant in Canoga Park, Calif.

FACTORY 70TH YEAR OF PUBLICATION
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Turn the page for FACTORY's Problem-Solving Guide

PROBLEM-SOLVING GUIDE

Leads to read and save

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THIS FILING SYSTEM is designed to give quick access to past FACTORY articles that can help you solve your current operating problems. Here's how it works:

1. All major articles (set here in bold type) and many short items are classified according to a functional code. Codes cover basic operating responsibilities.

2. Certain articles are also coded (see numbers in parentheses) to show secondary or closely related topics.

3. To use, cut up the items below. Paste them on 3x5-in. cards, file by code number. To cross-index, copy information on a second card, file by secondary code.

For ways to use your Guide, write Reader Service, FACTORY, 330 W. 42nd St., New York 36.

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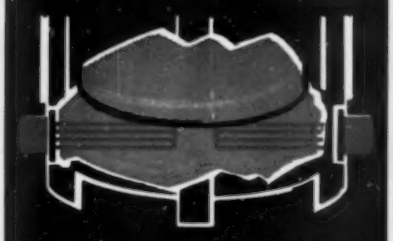
LABOR COSTS (3.4)

3.401 Just growed, like Topsy (Sept. '61) p. 192

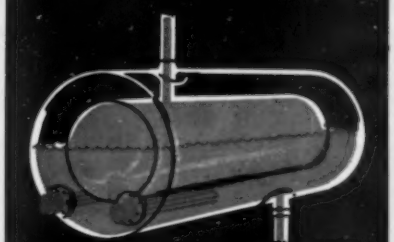
CHROMALOX Flange-Type ELECTRIC IMMERSION HEATERS

Fast, Uniform, Leak-Proof Heating for water, hard-to-contain liquids and gases

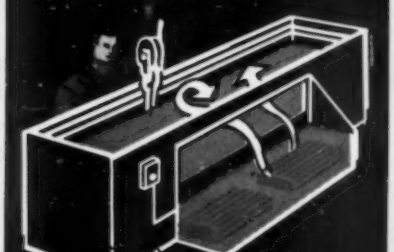
Chromalox flange type immersion heaters are made in sizes from 3 KW to 125 KW, 3" to 14", steel or stainless flanges, Steel and Incoloy sheaths.



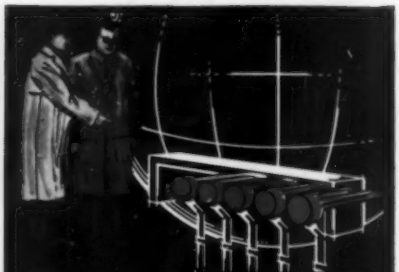
Heaters, mounted into jacketed kettles, give uniform and accurately controlled heat transfer for critical resin processing.



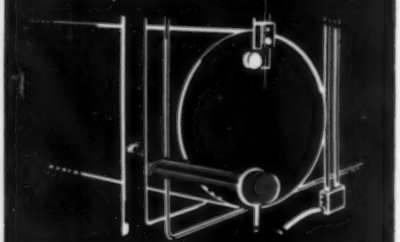
Insulated electric vapor kettle with self-contained heat transfer medium gives fast, uniform, controlled heat up to 700°F.



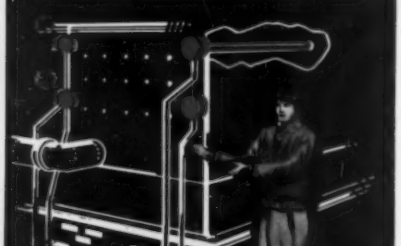
Chromalox immersion heaters vaporize trichlorethylene in side tank; vapors circulate into main tank where they efficiently degrease metal soils.



Off peak power use and the elimination of boiler, building, and smokestack more than pay off when immersion heaters mounted in storage tank, heat water to required 180°F temperatures.



Water automatically heated to 150°F by Chromalox heaters eliminates oil storage tanks, burners and maintenance; assures hot water for washrooms and other needs.



Chromalox immersion heaters operated on off peak rate "freeze-proof" water supply in plant's boilers on cold winter nights and weekend shutdowns.

Chromalox Flange-Type Electric Immersion Heaters are quick, easy and economical solutions to heating compressed air and other gases, for super-heating steam and for heating liquids of all types, including Dowtherm, Arclor, Prestone and similar heat transfer mediums. They are particularly well adapted to special high-temperature/high-pressure applications and for use in corrosive solutions. The relatively small displacement of the heaters and their high outputs, make them ideal for large volume heating with minimum work-area interference with the tank and minimum impedance to the flow of fluids. Standard heaters furnished with 150 psi flanges, special flanges withstand up to 4500 psi.

GET THE FACTS

See for yourself how Chromalox Immersion Heaters can help improve efficiency and/or decrease costs. Write for Catalog 60 and Industrial Process Bulletins.

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WI-21

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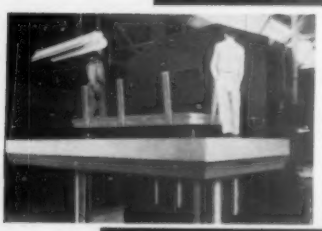

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LETTERS

FACTORY aids the national defense

Dear Sir:

We believe your article "Critical Path Scheduling" (July 1960, page 74) will be of significant value to potential bidders on Minuteman ICBM site construction. This general method of scheduling is being considered for these projects.

We would like permission to reprint your article for distribution to potential bidders. We would also like to use the terms "critical path method," "critical path scheduling," and "critical path network" in contract specifications, correspondence, and in discussions with contractors.

Your kind assistance on this matter will be greatly appreciated. It will, I feel, contribute materially to speeding construction of our Minuteman sites.

Jesse L. Fishback
Lt. Colonel, Corps of Engineers
Chief of Operations Division
U.S. Army Corps of Engineers, Los Angeles.

►We are happy to grant permission to reprint the article and use the terms cited. If we can be of further help let us know.—ED.

Australia sends a maintenance SOS

Dear Sir:

One of our clients, Toowoomba Foundry, is anxious to obtain reference books on ranges of standard times for operations encountered in machine tool maintenance. I am writing in the hope that you will be able to tell me if there are any publications available dealing with this Standard Time Data in detail form.

Any information that you can supply will be very much appreciated.

Kenn P. Forman
52 Pitt St., Sydney, N.S.W., Australia

►Published data of this kind exist commercially but only at a big price. There are no free data to our knowledge. However, a trained industrial engineer can develop such material for you by using the chapter on "Work Measurement" in Morrow's Maintenance Engineering Handbook as a guide. FACTORY's article on "Work Measurement in Maintenance" (January 1955, page 84) should also be of help.—ED.

Line of Balance gets still more praise

Dear Sir:

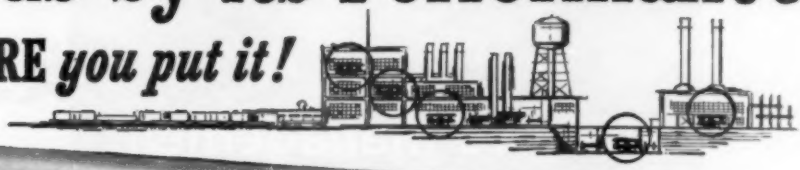
I read your article "Production Gets a Crystal Ball That Works" (July 1961, page 71) with much interest. I feel that the Line of Balance technique is an excellent monitoring system. I've been working with it and advocating its use for several years.

R. F. Tenney
Space Guidance Center, IBM, Owego, N.Y.

Turn the page

Conspicuous by its Performance

...no matter WHERE you put it!



Clark Model CMB-2 Balanced/Opposed Air Compressor rated at 400 bhp. Models available from 75 to 8000 bhp.

CLARK Balanced/Opposed AIR COMPRESSOR

Air Power—100 lb. Variety—The kind that is economical, dependable . . . That's what you get with a compact Clark Balanced/Opposed Air compressor. You may hide it in the basement or the boiler room, but this smooth running veteran will always be conspicuous by its performance.

Efficiency at All Key Points—Compressor cylinders utilize large, streamlined air passages and optimum number of valves to minimize pressure drop, turbulence and valve losses. The heavy duty *Simplaire* valve has only one moving part on the low pressure suction side. Its webbed disc valve ring is opposed by minimum spring force, operates with less total differential pressure than any other compressor valve design. The Clark intercooler is carefully engineered for highest possible heat transfer rates. Double wall construction provides a large surge chamber to minimize pressure drop and assure maximum delivery of air.

A Real Space Saver—Squeeze it into "impossible" places . . . install large amounts of horsepower in limited areas. Compact Clark design with overhung integrally supported rotor makes the most of available space, eliminates bulky extension shafts with outboard bearings and flywheel.

Perfect Running Balance—Clark Balanced/Opposed design cancels out primary and secondary unbalanced forces. Units run smooth and quiet, thereby easing wear on moving parts. Foundations need only be large enough to support the physical weight of the compressor. You can locate a Clark machine anywhere . . . with confidence.

Low, Low Maintenance—Internal components are easy to get at, easy to service. Clark *Simplaire* valves are ultra simple in design, can be readily installed, or disassembled and cleaned. Valve bodies and housings of like size are completely interchangeable for suction or discharge, offer no alignment problems.

Put Greater Efficiency into every compressor dollar you spend. Contact your nearest Clark representative for full details, or write for Bulletin 185.

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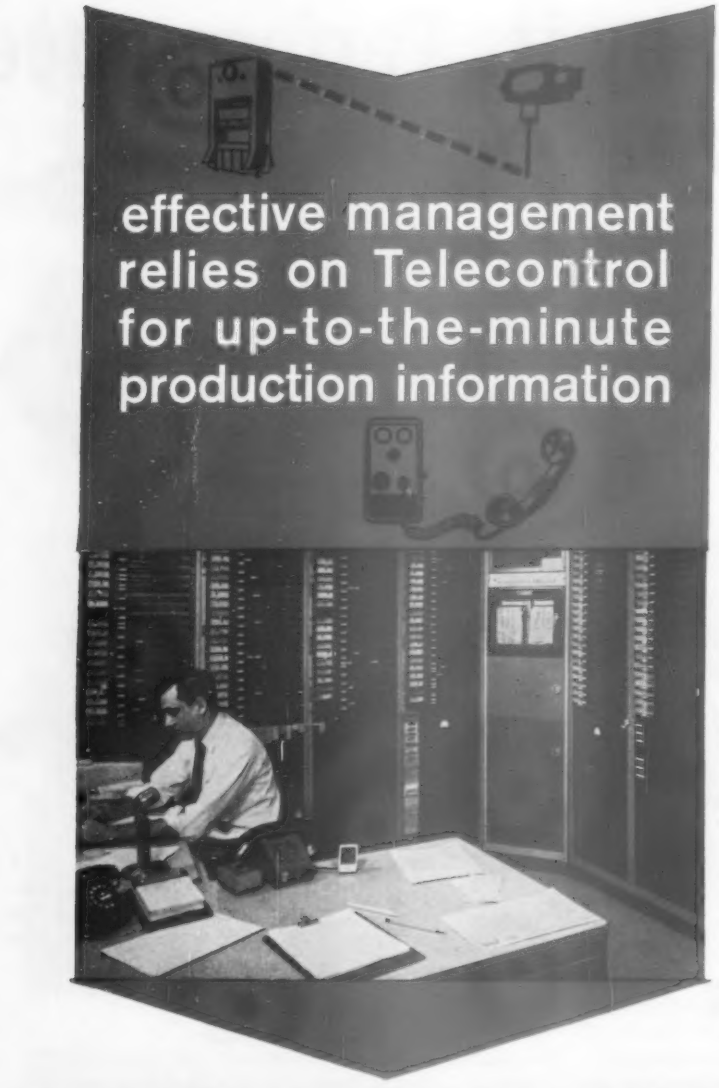

Telecontrol's centralized Control Room constantly shows at a glance the overall production picture throughout the plant—what has been produced . . . what is being produced . . . what remains to be produced . . . at each and every work station.

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to manufacturing management

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Begins on page 6

LETTERS

Stamps—pros and cons

Dear Sir:

I had to clean up after a safety stamp program similar to the one in FACTORY (June 1961 issue, page 178) and would like to say that the program resulted in the worst safety record the plant ever had.

Not only did the stamp program cost nearly $1000 a month in cash, but soon the union and the employees considered the stamps a fringe benefit. Meanwhile, the safety record went from bad to worse.

You can't buy safety. The only answer is stern discipline and good cooperation from the union.

W. O. Merritt
Promotion Manager
Advertising and Sales
Clayton Mfg. Co.
El Monte, Calif.

Plant housekeeping

Dear Sir:

We're planning a good housekeeping program that may include departmental competition. Do you have any information on the subject or could you refer us to sources of information? We have about 200 employees.

D. B. Weaver
Industrial Engineer
Allen-Morrison Sign Co.
Lynchburg, Va.

►**You should find the following FACTORY articles helpful: "How To Rate Your Housekeeping," March 1947; "Weekly Housekeeping Reports Spur Plant Cleanliness," April 1949; "Yearlong Contest Gets Workers Into**

FACTORY welcomes opinions and suggestions from its readers. They help us put management problems in better perspective. Letters should be addressed: The Editor, FACTORY, 330 West 42nd St., New York 36.

For more facts Circle 411 on Reader Service Card

Want to be an Executive?

Management is actively looking for engineers who have the desire and ability to become administrators

by
James M. Jenks

In a sense, this is the golden age for engineers. Once buried in corporate obscurity, many of them have emerged today as likely heirs apparent to the big jobs — and the big rewards — of business and industry. One impressive indication of this growth is that money spent in research and development over the past fifteen years has increased six-fold.

Despite this stepped-up activity, however, the once disorganized scramble for engineers seems to have ended . . . at least temporarily. And perhaps it's a good thing. Actually, the more perceptive engineers had always realized that unusually high starting salaries were often illusory. The gap between money being offered beginners and the incomes of experienced men was narrowing rapidly. Further, more and more thinking technical men concluded that even top engineering salaries are low when compared with the remuneration of highly placed general executives.

A Plan to Help the Engineer Succeed

Happily, there is a route to increased incomes that is satisfying to both engineer and company alike. This route leads into *management*. It is no easy road but the rewards are great for those willing and able to follow it.

In the vast, complicated world of business the engineer has much to learn. As a manager his duties will bring him into contact with accountants and buyers, advertising men and salesmen, lawyers and other executives. A strange new set of circumstances confronts him. He must gain confidences and be understanding, learn and instruct, be sympathetic, paternal or commanding as conditions require . . . and all in the midst of a business organization about which his knowledge is limited.

Actually, it comes down to this: To succeed as a business executive, the engineer must learn the art of making decisions quickly and accurately. And this ability is, of course, directly dependent upon knowledge. The "principles" of business—while not as scientific and inexorable as those of engineering—are no less important . . . no less essential to efficient procedure.

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Begins on page 6

LETTERS

Cleanup Habits," September 1953; and "Four-Step Program Pays Off With a Cleaner Plant," June 1960. A few may seem outdated, but the principles they invoke are still appropriate.—ED.

More about axe-wielding

Dear Sir:

Your article "Management Wields the Axe" (April 1961, page 64) has caused a good deal of discussion in our group. In fact, we're definitely interested in conducting a program around the topic this year.

As a reader of FACTORY, may I say you have done an outstanding job in keeping plant management informed of the many things that are of practical, daily use.

Melvin A. Clark
President
Dayton Chapter
Society for Advancement
of Management
Dayton, Ohio

FACTORY

September 1961 Vol. 119, No. 9

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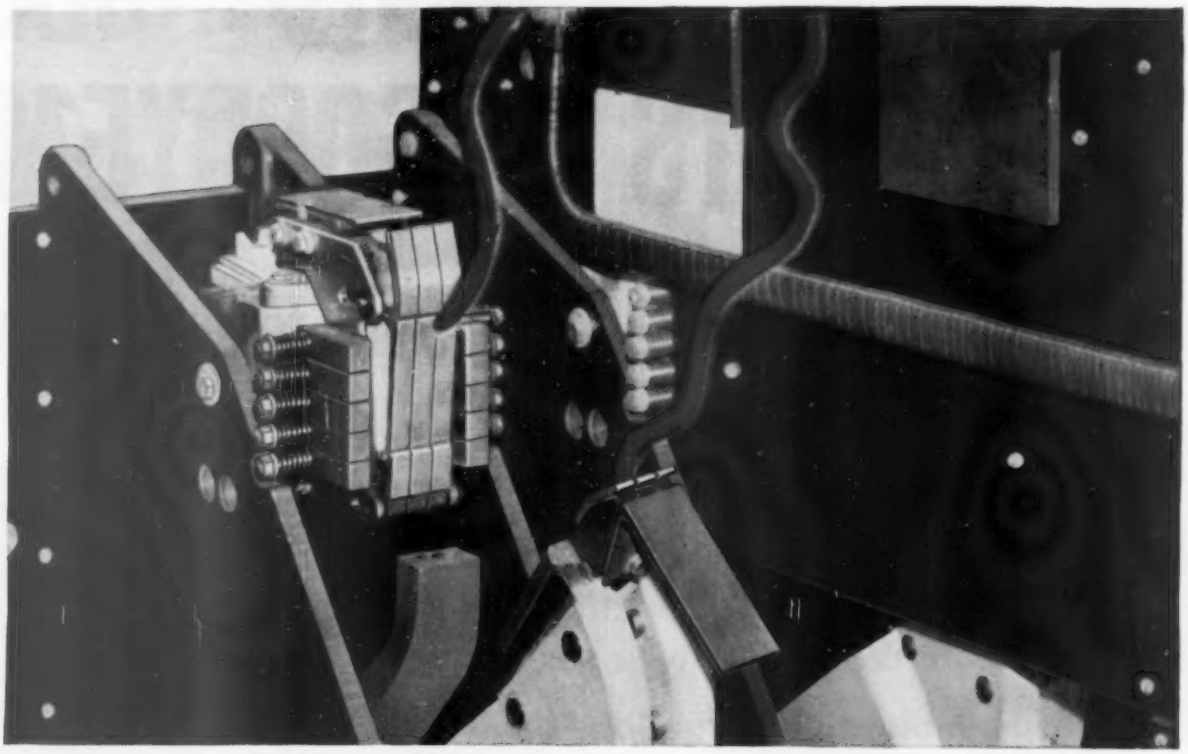

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with this 15-kv maximum reliability metal-clad switchgear

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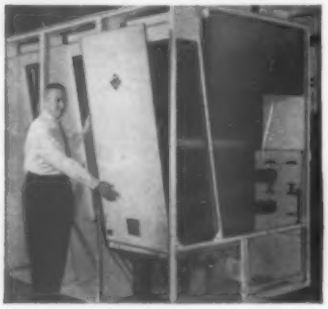
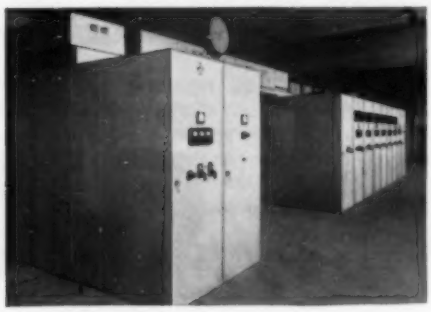


Tilted front steel barrier locks with cubicle to protect operator.



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YEAR
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Could this strike have been avoided? How? Compare your solution with that of labor expert . .

George Odiorne

This good industrial engineer turned out to be a not-so-good negotiator. He was defending engineering changes; the union was protesting work standards. But they weren't even talking about the same thing.

The sales department had come in, in late spring, with the sad news that foreign competitors were cutting the market to bits. Unless prices could be cut before fall, the Arbor Toy Company would be out of the ball game in the coming holiday market.

The executives took a hard look at the situation. Maybe they could still come out with a whole skin—*if* they could cut factory costs.

Bill Tinker, the plant manager, sat in on the meeting, but he shrugged his shoulders when this conclusion was reached.

"You fellows know I'm a bit weak on that aspect. In fact, I don't even know where to begin. I'm mainly a toy designer, and I can set up a line to make them. But I really don't have much taste for all this methods stuff."

He thought for a minute. "Mebbe I could get one of these young industrial engineers to come in and work for me. He might be able to suggest some new methods that would cut down on production costs. One thing, though: I won't have him suggesting short cuts that will affect the quality of the toys we make. We've always led in quality, and foreign competition or not, I won't have any part of turning out junk."

The management board agreed with this. Said one of the executives: "I think it's really an indication of the size of the man that he admits his inadequacies so frankly. And I agree that we've got to get some industrial engineering and methods talent in here for tooling, methods, and cost control."

It was agreed that one of them would start a search on a crash basis and would hire a new man to come in as plant engineer with responsibility for costs, methods, and jig and fixture design.

An ad in the paper brought a whole batch of applicants. These were quickly screened down to three. Finally, they settled on Tom Turner, a former methods and industrial engineering man for a large specialty manufacturer. Tom was eager to get a spot where he could set up an industrial engineering department, even though it was only a one-man department to begin with. He had been a staff I.E. for several years, and felt that he'd like to get a position where he could really show his stuff.

"You've got a pretty free field to cut costs," the president told Tom, "but don't ever forget that Bill Tinker is plant manager, and his decisions on quality and design are the last word. You report to him. This may take some diplomacy on your part, since he's the creative brains of this outfit, and you may find him a little bit temperamental. If you get into any really dead ends, bring the problem to me. But I don't want you short-circuiting Bill. If you have to come to me, bring him along with you. I don't think there'll be any serious conflicts, though, since we all understand the situation we're in. But we expect you to do a real job on these costs."

By early summer Tom Turner was on the job, and he started to hit pay dirt right off the bat. He found lots of fat and duplication, and learned that with some jigs and fixtures he could increase output as much as 30% without adding labor.

Tom was able to persuade Bill Tinker to let him look at all the plans for assembly and manufacture before they were actually firmed up. This way, he managed to cut costs considerably on several new items before they even got into production.

The biggest problem, however, was the space rocket game, which was the big staple item planned for that year. It had been introduced the year before, and went over big. This year, though, a couple of foreign toy makers were planning to come into the market with duplicate products—at about 20% below the current Arbor Toy prices.

Turn the page

SPACE–
TIME–
MONEY—

Save All Three with Square D QMB POWER PANELBOARDS

MOTOR STARTERS AND BREAKERS OR SWITCHES COMBINED IN ONE SPACE-SAVING PANELBOARD!

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If the above installation had been made the old way —with trough, and ganging separate switches and starters—it would have taken at least six feet of wall space instead of 30 inches, and four times the installation time.

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QMB panelboards accommodate reversing or non-reversing starters, sizes 0 through 4; plug-in circuit breakers through 225 amperes; plug-in switches through 200 amperes (bolted through 600 amperes).

Twin Unit (above) available 15-100 amperes
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ON STRIKE . . . *Begins on page 14*

Tom Turner thought he could cut costs more than enough to meet the new price—if he could get some cooperation from both Tinker and the union.

Basically, his plan was to revamp some of the methods of molding the plastic components. But he felt this was only a beginning. He was sure he could cut assembly costs by a substantial amount if he could get the people to follow new methods.

Under the original system, the assembly parts were routed along a conveyor from station to station. As each operation was completed, the assemblies were placed back on the belt, beyond a stop bar. The belt then carried them along to the next station.

The problem, as Turner saw it, was that there were several people working on a single operation, so there was no way of measuring individual performance. From some casual observation, he noted that there were great differences in the output of different people doing the same operation.

In fact, the workers had developed an informal system of sorts. One person would usually carry the bulk of the load for a short while, then he would slacken off and another would start working harder. This alternating pattern of "work hard, then rest awhile" characterized the whole line. From some quick timings of operations, Turner figured there were about a third too many people on the line. Here was his chance to make some changes that would really count.

His recommendation was to establish standards for each worker, and start attributing and measuring output accordingly. That way the excess labor would be brought to the surface, and the company could cut some people out of the line. Turner talked this over with the plant manager who agreed that it should be tried. But Tinker suggested that they discuss it with the union first, as spelled out in the contract.

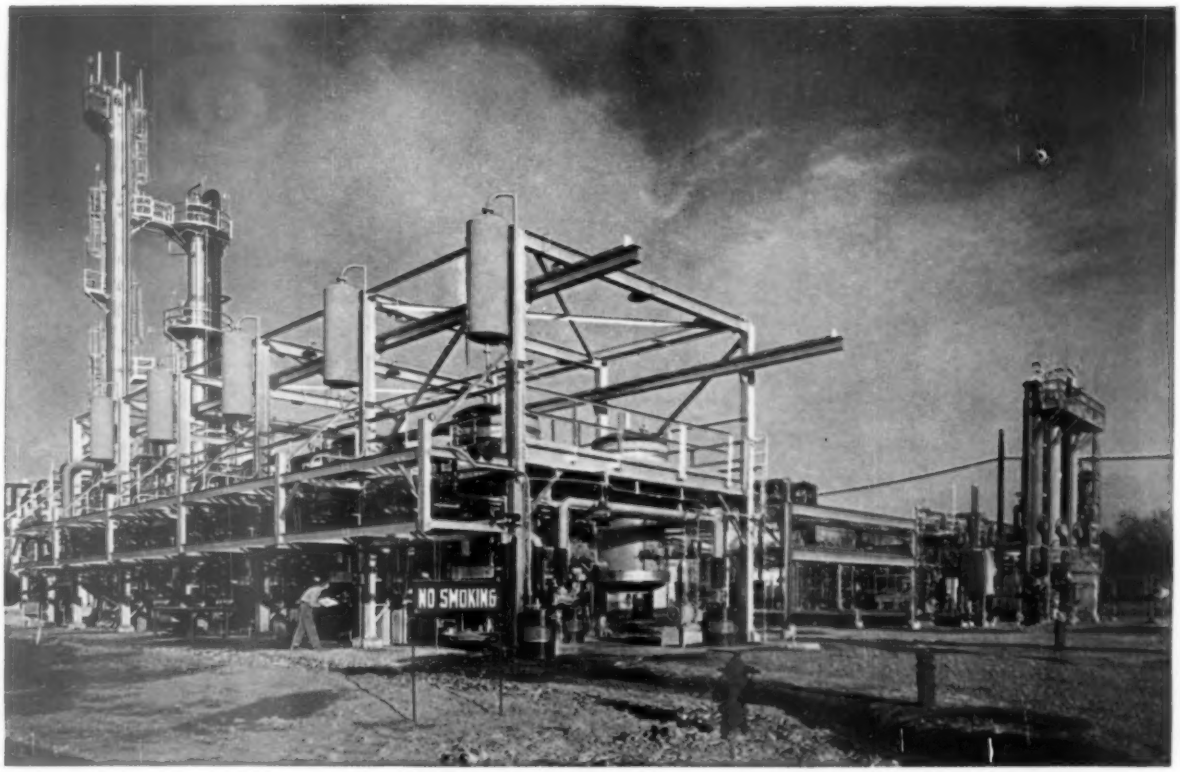
The steward was Mary Smith, an old-time employee. She was interested and listened carefully, but indicated that she would have to talk it over with the international representative before she could give them an answer. A few days later she was back.

"The union doesn't feel it wants to object to a methods study or engineering improvements, especially since we have foreign competition and all," she said, "but we want to have some protection. The workers shouldn't have to pay too big a price—in personal fatigue and speed-up—for the improvements. So what we want to do is put an amendment into the contract that, since you have a new industrial engineering department, work standards will be subject to the grievance procedure if we don't like the rate."

"Does this mean that you also want to arbitrate the engineering of the method?" asked Tom Turner. Mary didn't know, but said she'd find out. A few days later she came back and said that the union definitely wanted to arbitrate standards. Tom informed her that engineering changes could not be arbitrated. After that he heard no more from Mary.

Two weeks later, he had his drawings made for changing the conveyors, and the plant closed for three days while the millwrights rearranged the equipment.

Turn to page 21



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Rocks and clay race down a mountain at a 3000-ton-an-hour clip. They're the makings for California's Trinity Dam. Carrying heavy loads like this once required a series of many short-length conveyor belts. But extra-strong BFG belts span the two miles in just a few long flights.

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Fact is BFG has developed belts to carry just about everything imaginable. Some kinds haul hot material. Some carry oil-soaked parts. Others are made especially for food products. Some are made to carry things up steep inclines without backsliding. What they all have in common is this. They save money because they're engineered for the job to be done.

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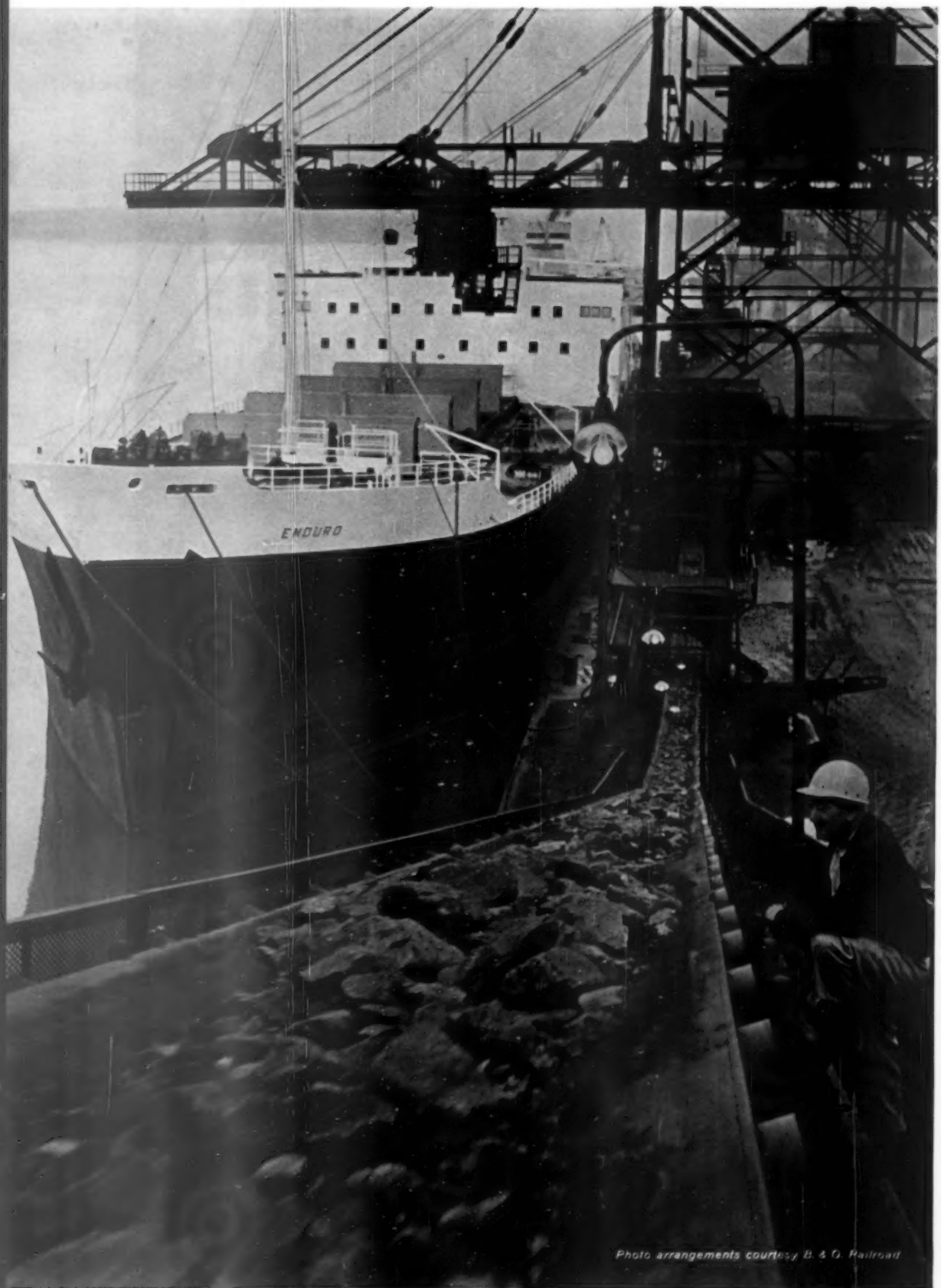
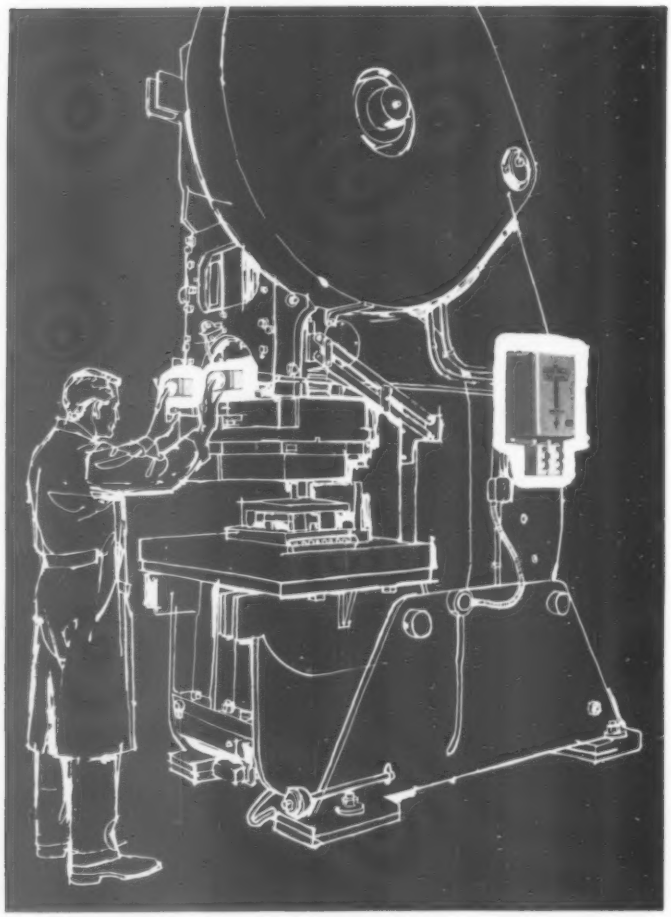


Photo arrangements courtesy B. & O. Railroad



DO YOUR PUNCH PRESSES REALLY MEET THE SAFETY CODES?

It's a shock to find that virtually all conventional machine controls fail to truly meet the non-tie-down specifications. Most are designed so that when a stroke is interrupted, it can later proceed unexpectedly. And, that's the stroke that can maim or kill!

Recently an accident occurred on a friction clutch press which a conscientious management had fully equipped with 2-hand controls and the so-called one-stroke or anti-repeat feature. After the costly loss the company began asking itself how the accident happened on a machine they thought was completely safe. They carefully reenacted the sequence and found that the operator had interrupted the stroke by taking his right hand off its control and then attempted to straighten the material in the danger zone. In doing so he inadvertently touched the control with his shoulder and because he still had his left hand on the other control the machine completed the stroke, seriously maiming his hand.

They found an answer . . .

The company found the answer in a MICRO SWITCH Trip Control unit that was quickly and easily mounted on the machines. An exclusive "can't cheat" feature prevented the dangerous possibility of the operator tying down or wedging one switch and operating the control with one hand. Resumption of the stroke, as in the accident situation, could not occur without the operator taking both hands off the controls and then intentionally touching both simultaneously (or *all* control switches on machines with more than one operator). A unique "fail-safe" feature prevented accidental actuation of the clutch that might have been caused by any faulty or damaged component in the system.

On new installations . . . production increases!

When MICRO SWITCH Trip Controls are installed to electrically modernize machines, production increases because operators experience less fatigue actuating the low-force electric switches and a fast work rhythm soon becomes natural due to the smooth, two-hand operation. Instant electric clutch actuation also eliminates "lag" between operator action and machine action.

MICRO SWITCH Trip Controls are approved and/or recommended by many states including: New York, Pennsylvania, California and Wisconsin. Packaged kits are available to fit virtually all hand-operated machines and the units start as low as $60.00. See your MICRO SWITCH Distributor listed in the Yellow Pages or write for Catalog 65. MICRO SWITCH . . . Freeport, Illinois, a division of Honeywell. In Canada: Honeywell Controls, Limited, Toronto 17, Ontario.

ON STRIKE . . . *Begins on page 14*

When the girls came back on the following Monday, they were instructed in the new method, and a number of them were displaced. Five of those with the lowest seniority were laid off. But it was expected that the seasonal rise in business would enable the company to rehire them for other jobs in about a week.

At lunch hour, Mary, the shop steward, was seen to leave hurriedly. At two o'clock she came back with the international representative. He immediately went to Bill Tinker's office.

"We want a new contract clause," he said, "and we want your changes in standards to go right through to arbitration if necessary."

Tinker was dismayed by the conflict, and he took the union leader to the president. Tom Turner was already there. The president listened to the union leader repeat his demand that the work standards be made subject to arbitration.

"I'm sorry, but it's not good practice to arbitrate engineering changes," the president said curtly, "and we can't afford to change the method. We've made too big an investment. The change stays."

That night the union met and voted to strike. Next morning, they had a picket line around the plant.

Now George Odiorne tells how this strike could have been avoided

What looks like an unavoidable strike on a matter of principle was really a failure to observe the basic rules of good communications. The international representative thought there had been a standards change. Actually, it was an engineering change. Here are some steps that might have averted this strike:

(1) The president might have instructed Turner not to do his own negotiating, but to refer such matters to others more expert. Furthermore, Turner didn't have all the facts before he made his decision.

(2) A professional negotiator would have got directly in contact with the international representative sooner, instead of having Mary (who was just a messenger) do the talking. Turner had made some engineering changes, the union asked to arbitrate work standards. They weren't even discussing the same thing.

(3) The big error here was a failure to communicate in advance about what was actually going to happen. The changeover was abrupt, the girls were dismissed without any prior hint, and the international representative was not brought in and sold on the idea, or on the necessity of better methods to meet foreign competition. On top of all this, add the abruptness of the president's decision (presumably with Turner's advice). Result: Equally abrupt trouble.

A little chit-chat, information-giving, attitude-setting, and warm-up with the real union decision-maker would probably have headed the strike off.

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LIFT $400
MODEL PUL
for safe, speedy one-man overhead maintenance work!
Quickly pays its way by wiping out dangerous inefficient make-shift elevating practices
Lowers compactly for convenient storage and transportation through conventional doorways
Four Model PUL'S
Style Lift Price
No. 1 10' 9" $370
No. 2 11' 9" 390
No. 3 15' 0" 480
No. 4 19' 0" 515
Add 7 ft. for working height
F.O.B. Chicago, Ill.
Special models and higher lifts available
Write for Information
HEADQUARTERS FOR OVERHEAD SERVICING LIFTERS SINCE 1901
ECONOMY ENGINEERING
4527 W. Lake St., Chicago 24, Illinois

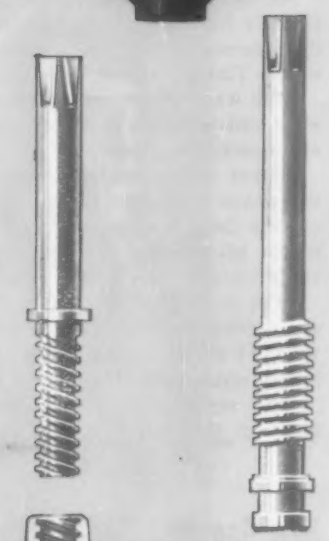
WHAT MAKES A VALUE VALVE?

HAND WHEELS

When you are looking for a valve which will give plus values all along the line, your best bet is "Williams". The standard hand wheel, for example, is a non-heating malleable iron type, providing a firm hand grip for easy operation.

STEMS

Two types of stems are used: rising and non-rising. They are made of D. T. Williams® silicon bronze and conform to ASTM Specification B-198, grade 13 B. The rising stem, of course, visually indicates whether the valve is opened or closed. Valves with non-rising stems are most suitable where space is at a premium.



DISCS

Solid or double discs are used with the choice dependent upon the type of application. Solid discs, for example, are ideally suited where solids or semi-solids are carried in the fluid. The disc tends to crush the particle when it closes, does not trap, clog or malfunction. Double discs stay tight when subjected to temperature fluctuations. They are used with light, volatile hard-to-control fluids. Both types are made in a wide variety of metal alloys.

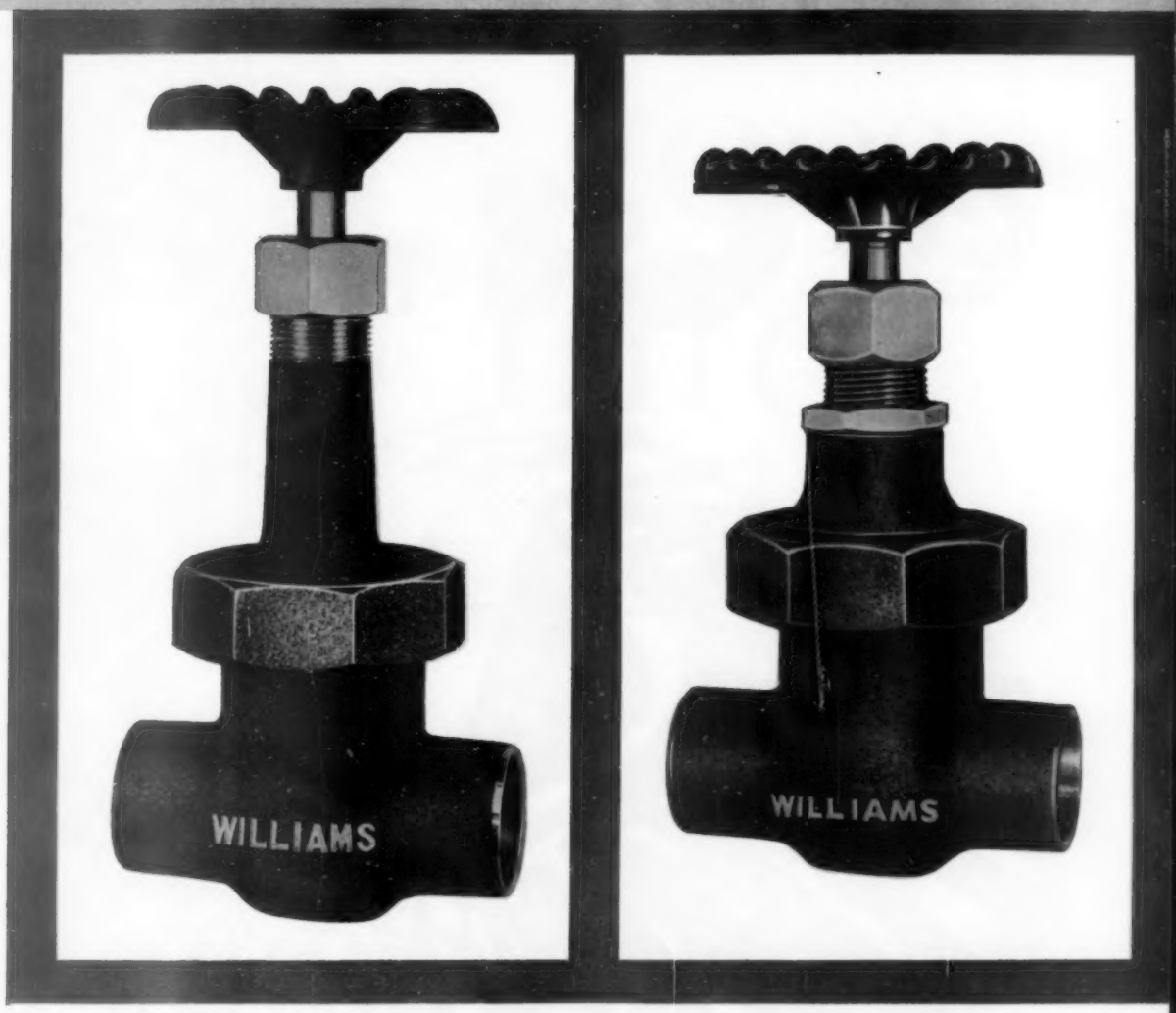
UNION BONNETS

Union bonnets are made of D. T. Williams Steam Bronze conforming to ASTM Specification B-62. They provide strong joints which remain tight under extreme pressure and temperature service conditions. External body threads permit assembly and disassembly without damage to threads or machined parts.

BODIES

Bodies, too, are of Williams Steam Bronze conforming to ASTM Specification B-62. They feature a full passage through the body, when open, equal to the nominal size of the connecting pipe. The Williams name is cast into the body —your assurance of a value valve.

D.T. Williams®



Three new D. T. Williams valves have just been introduced by American-Standard Controls Division. The first two are 150-lb rising stem gate valves with either a solid bronze disc (fig. 1343) or double bronze disc (fig. 1341) with integral seats. The third (fig. 1342) has the same rating with a non-rising stem and a solid disc. All three have sweat connections. They can be repacked under pressure when fully opened. Nominal sizes for Fig. 1341, 1342 and 1343 are as follows: ⅜, ½, ¾, 1, 1¼, 1½, 2, 2½ and 3 inch. For information see your D. T. Williams distributor or write *American-Standard Controls Division, 5900 Trumbull Ave., Detroit 8, Mich.*

AMERICAN-Standard
CONTROLS DIVISION

SEE OUR CATALOG IN SWEET'S

For more facts Circle 421 on Reader Service Card

Morse goes into gear!

with a new line of 20° pressure-angle stock gears at the price of 14½° p.a. gears. Morse introduces a new concept of value by offering 20° p.a. sets designed to replace 14½° p.a. gears. You pay no more and get over 30% more horsepower capacity. Spur, bevel, miter sets, helical, worm-and-gear sets are made from only the finest materials. Gears are produced with minimum plain bores to extremely close tolerances. Finish is excellent. If you're a wise gear-buyer you'll call your Morse distributor now! He's in the Yellow Pages. Morse Chain Company, Dept. 46-91, Ithaca, N.Y.

MORSE

A BORG-WARNER INDUSTRY

BW

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Choose the... ATLAS COPCO COMPRESSOR

that meets your needs best!

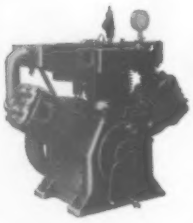
No one compressor can meet everyone's demands. However, there **is** an Atlas Copco compressor that will fit your requirements and no matter which you select, you'll get these specific advantages:

First, Atlas Copco compressors cost less to operate—consume less power per cubic foot of air produced than comparable units. Secondly, maintenance problems are at a minimum. One user reports a $3.10 expenditure after 10,000 hours' operation. And thirdly, you're **guaranteed** the free-air delivery we quote you—no "almost's" or "close to's". You get what you order!

Check the representative models shown here and then mail the coupon for a free catalog showing all the facts and figures! (No obligation, of course.)

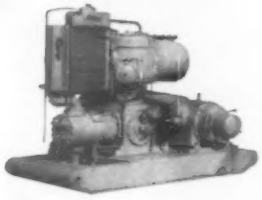
ER-6 Heavy-Duty Compressors

New! Fundamental improvements provide these three big advantages: (1) Only 18.3 hp required per 100 cfm at 100 psi, full load—10 to 15% **lower** than most compressors of this size! (2) Completely enclosed functional design protects external lines and fittings. (3) Extremely small space and simple concrete block required for permanent fixing—save on floor space, material and labor! Capacities to 1,140 cfm.



CT Air-Cooled Compressors

Stationary, or skid-mounted compressors for use where air demand is between 50 and 300 cfm. Totally air-cooled. Cylinder arrangement designed for smooth, vibration-free operation. Compact, rugged—for continuous, 24-hour trouble-free service. Highly efficient; low on maintenance costs.



AR-L Heavy-Duty Compressors

Same basic construction as the AR Series, but provided with an air-cooled intercooler and air-cooled radiator for the cylinder water. Fan on compressor flywheel cools radiators. Perfect for arid areas or where difficult to bring in water. Both stationary and skid-mounted models available.

FREE!

Write today for your free copy of our short-form catalog, describing the line of Atlas Copco stationary compressors. Ask, too, for detailed information on the model you need most. Use the handy coupon below.

ATLAS COPCO
Dept. F-6, 545 Fifth Avenue
New York 17, N.Y.

Gentlemen:

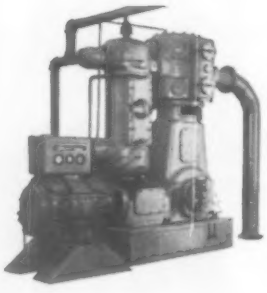
Please send me ☐ Short-form catalog
☐ Detailed information on the _____ Series

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____



AR Heavy-Duty Compressors

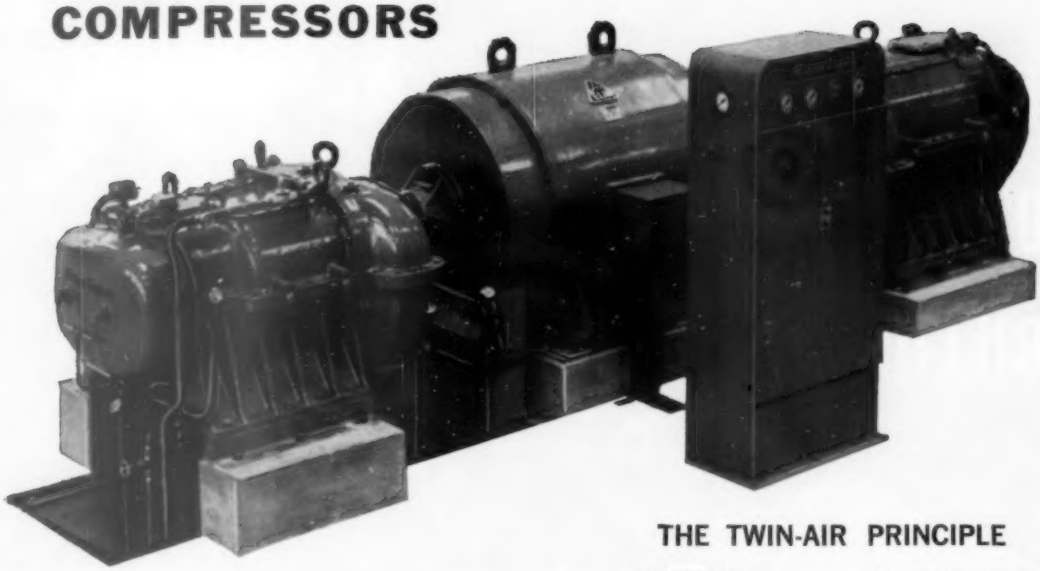
More air per horsepower than any comparable compressor! For continuous, full-load operation. "L" angle, 2-stage, double acting. Water cooled. Standard models provide 382 to 3210 cfm free-air delivery at 100 psi; only 76-590 hp required! (Can be supplied for other working pressures on request.)

Atlas Copco Atlas Copco

FACTORY

REVOLUTIONARY!

TWIN-AIR COMPRESSORS

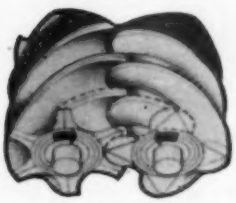


A basic departure in compressor design, employing precision-mounted helical rotors, with small clearances maintained by timing gears, thus eliminating friction (and the necessity for oil) in the compression chamber. "Twin-Air" Compressors offer surge-free delivery from 6,000 to 19,400 cfm at working pressures up to 115 psi. And, you get completely oil-free delivery of air or gas, since no lubrication is required!

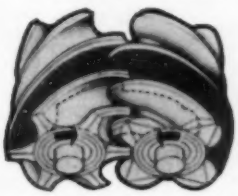
OPERATION: Air Intake: Air is drawn through the inlet into the space between lobes and housing. **Compression:** Motor revolves, sealing inlet and beginning compression of the enclosed air. Rotary motion continues, producing smooth compression, until each groove in turn reaches outlet port. **Air Outlet:** Pulsation-free compressed air is forced smoothly out of compressor and outlet is set again for the next cycle.

THE TWIN-AIR PRINCIPLE

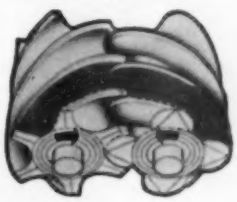
1. air in



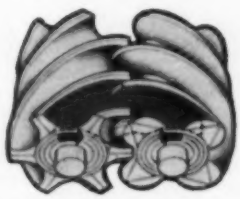
2. compression



3. compression



4. air out



Atlas Copco

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Paramus, New Jersey
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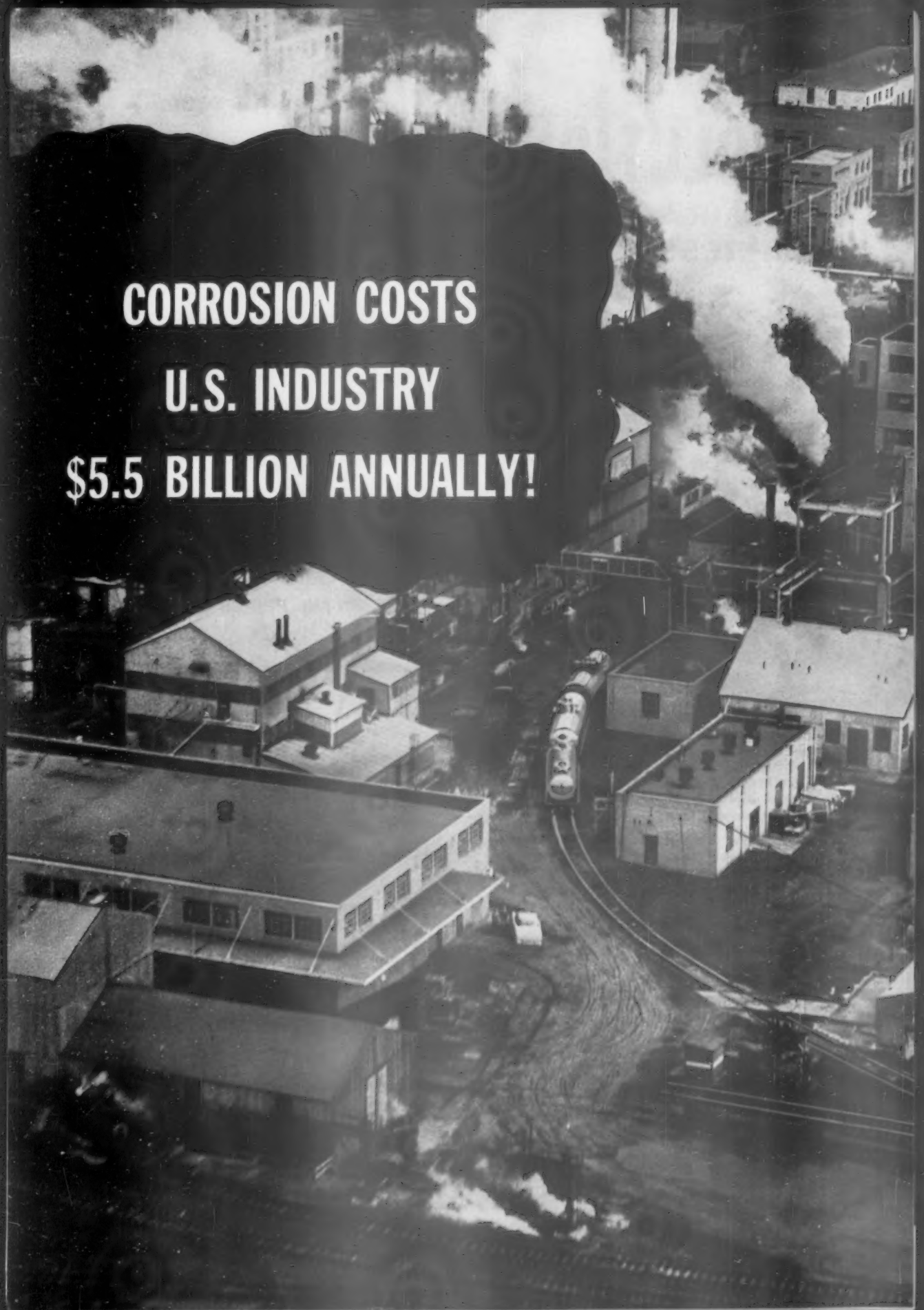
CORROSION COSTS
U.S. INDUSTRY
$5.5 BILLION ANNUALLY!

Now You Can Control 97% of All Your Corrosion Problems with this Proven PITT CHEM® Coating System!

Corrosion is one of the biggest profit robbers in American industry today. It is conservatively estimated that corrosion costs U.S. industry $5.5 billion annually . . . or $9,468 per minute! How much is this enormous waste costing *your* plant?

More and more corrosion engineers are turning to the *complete* PITT CHEM System of thick-film, cold-applied coatings for efficient long-lasting protection against corrosion. The PITT CHEM system is composed of over 20 different coatings, each formulated to control a specific type of industrial corrosion—from the most ordinary to the most severe—at minimum cost.

PITT CHEM Tarset, Tarmastic and Insul-Mastic are tough, *heavy film* coatings that outlast conventional maintenance paints 10 to 20 times. You measure their protection in *decades*, not years. They can be cold-applied by brush, spray gun or roller. No other family of protective coatings can solve so *many* of your corrosion problems so *economically*.

For your personal corrosion data file complete the coupon below and return it today. Then consult your nearest PITT CHEM Distributor—he's listed in the "Yellow Pages." He'll be glad to discuss your corrosion problems with you, and work out a corrosion protection program to meet *your* requirements, without obligation.

PITT CHEM TARSET®

The original, patented coal tar-epoxy coating, Tarset is being used throughout industry to solve corrosion problems that were once considered "impossible." This revolutionary cold-applied coating is ideal for the protection of underground storage tanks, pickling tanks, high temperature steam lines, waste tanks and similar equipment.

PITT CHEM TARMASTIC®

PITT CHEM Tarmastic coatings are a series of coal tar protective coatings designed to meet a wide variety of corrosive conditions at moderate cost. Their protective ability has been proven by years of service on concrete, stone and masonry surfaces, cooling towers, fan housings, tank exteriors, potable water systems and similar equipment.

PITT CHEM INSUL-MASTIC®

A series of high quality Gilsonite-asphalt mastics recommended for economical, long-lasting protection against moisture and atmospheric corrosion. Widely used as a weather and moisture barrier over metal buildings and equipment. Insul-Mastic insulating cork mastics provide good heat loss reduction and condensation control.

PITT CHEM PIPELINE ENAMELS

PITT CHEM Coal Tar Pipeline Enamels protect oil and gas transmission and distribution lines throughout the United States. These proven, high quality enamels are geared to meet a wide variety of underground service conditions and are backed by experienced technical field service.

PROTECTIVE COATINGS DIVISION
PITTSBURGH CHEMICAL CO.
GRANT BUILDING PITTSBURGH 19, PA.
A Subsidiary of PITTSBURGH COKE & CHEMICAL CO.

Send for Your Free Copy of this INDUSTRY CORROSION DATA FILE

Includes a survey of corrosion problems in general industry, data on PITT CHEM Coating Systems and a coating selector guide.

Protective Coatings Division, Pittsburgh Chemical Co., Grant Bldg., Pittsburgh, Pa.

Name_____ Title_____

Company_____

Street_____

City_____ State_____

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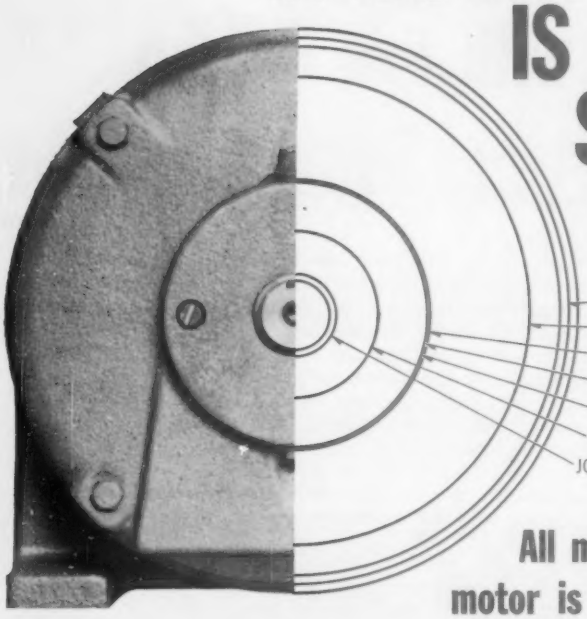
1189

A MOTOR IS A SERIES OF CIRCLES



All must be ACCURATELY CONCENTRIC if the motor is to run smoothly, quietly, trouble-free

CONCENTRICITY of Elliott C-W Motors begins with the bracket-to-frame fit, the reference for all subsequent "circles." Bearing bore and shaft bore are precisely centered within this accurate diameter.

TOLERANCE of 0.0007 in. for the bearing bore is checked by an air gage after finishing in a precision lathe. Master jig assures accurate positioning of bearing, essential to uniform air gap.

Elliott Crocker-Wheeler integral-hp a-c and d-c motors—from smallest to largest—are offered in all conventional enclosures and modifications; with insulation to suit the application, including EPOSEAL epoxy insulation, for use where conditions are most severe.

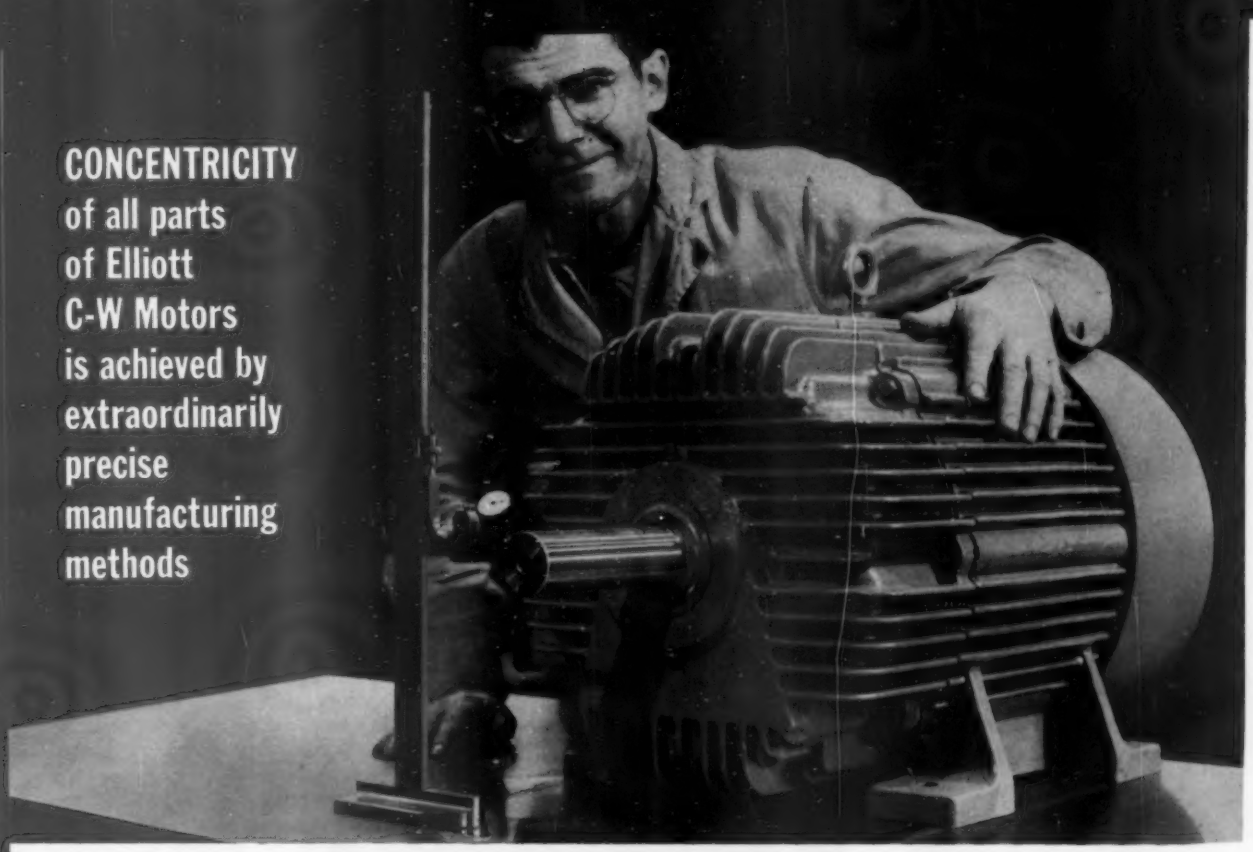
ELLIOTT COMPANY

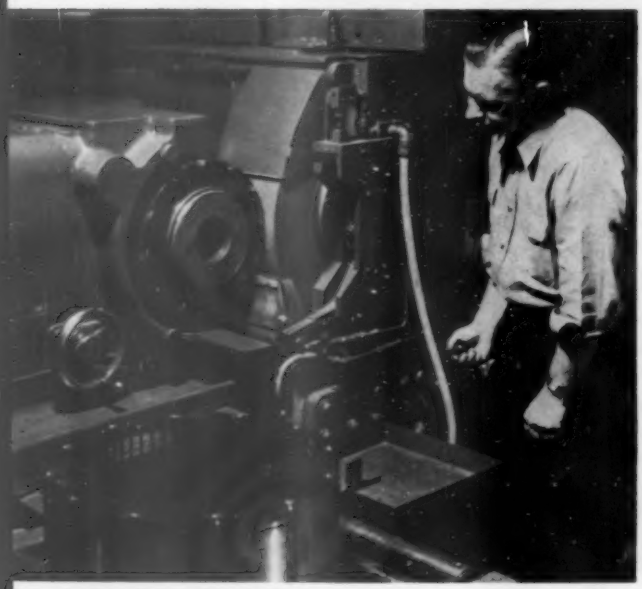
GENERAL OFFICES: JEANNETTE, PENNSYLVANIA

PLANTS AT: Jeannette and Ridgway, Pa.; Springfield, Ohio

TURBINES · GENERATORS · MOTORS · COMPRESSORS · TURBOCHARGERS · EJECTORS · STRAINERS · TUBE CLEANERS

CONCENTRICITY of all parts of Elliott C-W Motors is achieved by extraordinarily precise manufacturing methods

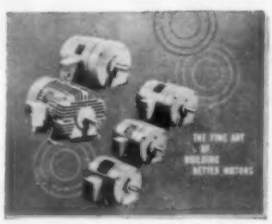




PRECISION GRINDER finishes the outer surface of the stator core to a tolerance of 0.001 inches. It is then pressed and keyed into stator frame, which has been finish machined concentric with the basic bracket-to-frame fit.

DUPLICATING the basic bracket-to-frame fit, a jig accurately positions the wound stator for finishing the inside core diameter by a "fly cutter," which corrects for all accumulated tolerances and assures precise concentricity.

Key manufacturing operations employed in maintaining the required close tolerances are described more completely in an interesting brochure, *The Fine Art of Building Better Motors.* We will be very glad to send you a copy.



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W1-2

F

ELLIOTT COMPANY, Jeannette, Penna.
Advertising Department

Please send a copy of *The Fine Art of Building Better Motors* to:

Name_____ Position_____

Company_____

UNISORB MACHINE MOUNTS

Save Money 4 Ways!

1. *Cut installation costs*
2. *Reduce 85% of vibration*
3. *Decrease wear and tear*
4. *Permit higher speeds and closer tolerances*

A DIVISION OF

FACTORY

Read what these users have to say about Unisorb . . .

Unisorb Machine Mounts don't cost you a cent! Remarkable but true, for only a few dollars investment Unisorb will start saving money in machine installation, save you money by drastically reducing vibration, and save you money by making it possible for your machines to produce more efficiently, at higher speeds and to closer tolerances.

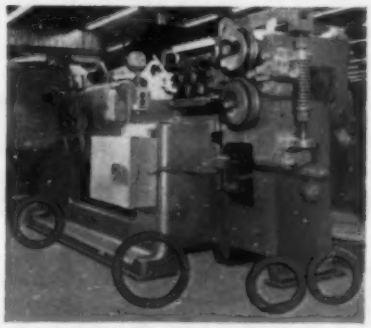
The proof is in a continuing stream of user testimonials that tell how Unisorb has made it possible to obtain real savings simply by specifying this modern machine mounting system. Excerpts as given here with typical installations, and the complete report is included in the Unisorb Facts Kit that describes Unisorb and its many features.

Whether it weighs pounds or tons . . . you can save money, too.

Unisorb is not just for one kind of machine. A complete line of 11 mounting devices and pads in a wide range of thicknesses and densities mean you can use Unisorb under everything from light laboratory and office equipment to 450 ton presses — over 150 different types of machines have been successfully mounted on Unisorb!

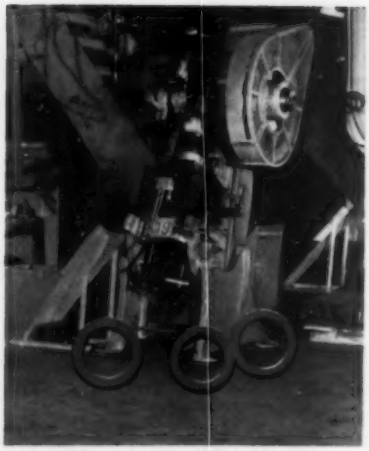
These are the cold, hard facts as reported by plant engineers and maintenance men. The savings, vibration control, improved machine performance are available to everyone who uses this modern machinery mounting system . . . the initial investment is small (under $10.00 per machine in most cases) and the savings and returns exceptional.

"Moved to new plant overnight. Unisorb saved us thousands of dollars and will save us more as time goes on".



"Tested thoroughly under heavy machinery and proved completely satisfactory . . . used under machines from 500 lbs. to 51 tons".

"Used exclusively in precision machining section, speeds installation, reduces noise".



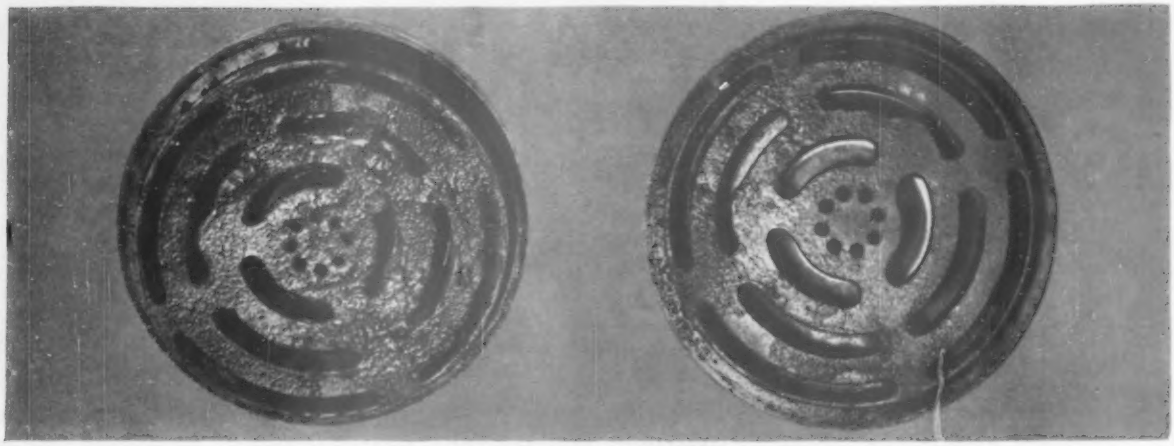
"Unisorb saved more than 50% per machine in installation costs, absorbs pounding from all types of presses".

"Every type of Unisorb mounting pad is used in the plant. No trouble or delay when rearranging. Operators report no tiring effects, no shock or deafening noise".

Send for Unisorb Bulletin and Facts Kit! The many types of Unisorb mounts, methods of installation and complete reports by users will show you how to start saving money right now. Contact your local Unisorb Distributor, or write direct.

UNISORB

THE FELTERS CO. • 206 SOUTH STREET • BOSTON 11, MASS.



Carbon building up in your compressors? Here's why one of the many Sun Solnus oils can be your answer. The valve on the left is from a three-stage Norwalk horizontal-type compressor after 3,000 hours operation with a well-known high grade oil. At the right is the same valve after a 3,000 hour run with a Sun Solnus oil. Note the difference in carbon deposits! *Solnus oils form very little carbon . . . and what does form is so soft it can be blown away!*

somewhere in your plant . . .

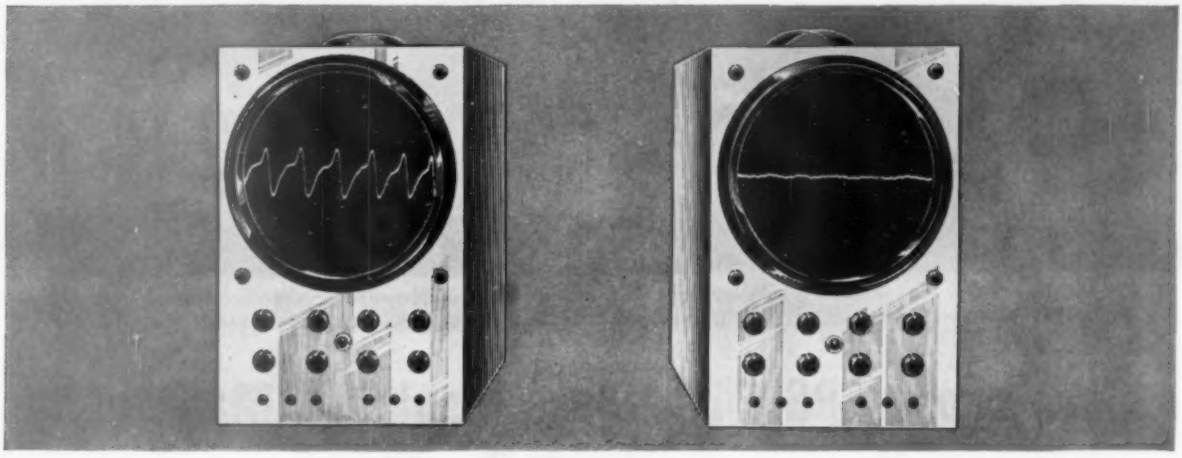
A SUNOCO PRODUCT CAN STOP TROUBLE, CUT COST!

SUNOCO
Quality . . .
THE BEST ECONOMY OF ALL

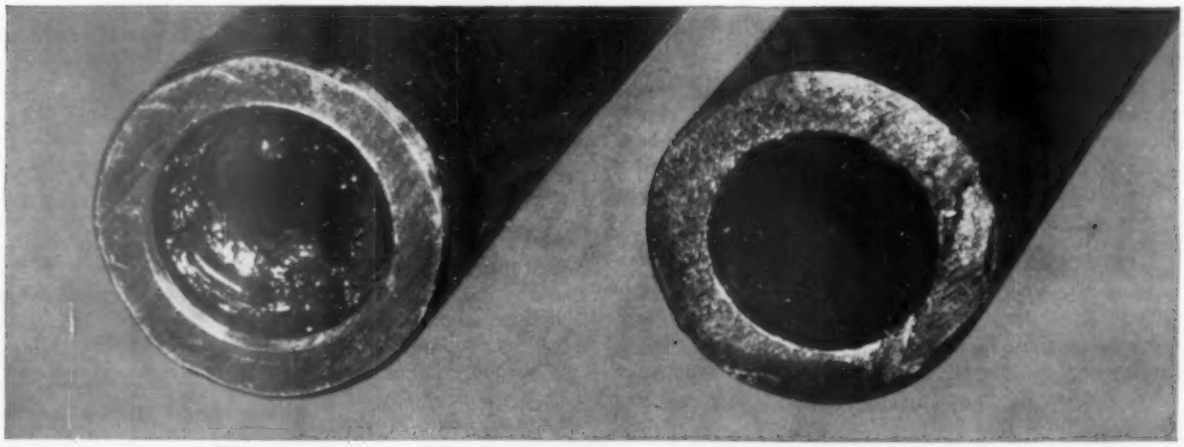
The reason is as simple as this. There are over 400 Sunoco petroleum products for industry. *Each* has the properties needed to do its job right. *Each* is job-fitted by men who know what they are doing. And *each* is backed by the service you have a right to expect. The examples on this page will give you an idea of what we mean by Sunoco quality . . . and how quickly that quality can pay off in your applications. Call your Sunoco representative today for a hand on any problem with any petroleum product you are using. Or write to:

SUN OIL COMPANY, PHILADELPHIA 3, PA., DEPT. F-9
In Canada: Sun Oil Company Limited, Toronto and Montreal

Hydraulic oils chewing up your O-rings, packings? The O-ring on the left was soaked in a Sun Solnus oil for 70 hours at 300F and is still as pliable as when new. The O-ring at the right was soaked in another hydraulic oil for equal time. It snapped like a match stick when flexed, for many hydraulic oils extract plasticizers from seals turning them brittle, creating leakage, replacement problems. Besides keeping rings flexible, Solnus oil restores pliability to unbroken rings already in service.



Slip-stick table motion ruining fine work pieces? These are magnified oscillogram patterns of slip-stick table motion. The jagged pattern on the left resulted when regular way oil was used on the ways; the straight line on the right, when Sunoco Way Lubricant was used under identical operating conditions. Here is graphic evidence of how effectively you can stop slip-stick table motion, protect the ways, get better surface finishes, and cut production losses with job-fitted Sunoco Way Lubricant.



Hydraulic lines gunked up? The fouled up line at the left was cleaned out in no time when a Sunvis 700 hydraulic oil was used in the system! These oils are especially made to keep contaminants in suspension, flush them away to the filters while transmitting power. They are so effective that a single charge of a Sunvis 700 oil can keep even a continuously contaminated system running smoothly for months, often *years*. Check your Sunoco representative for a job-fitted Sunvis oil for your systems.

PPG Fiber Glass Pipe Insulation is quickly installed, provides top thermal insulation at Fontainbleau Towers addition in Miami Beach. 100,000 ft of this insulation was used, as well as PPG Duct Liner and Duct Insulation.

"We chose PPG Fiber Glass Insulation Materials because they are easier to handle than any other insulation products"

... says Mr. Joseph Crabtree, President, Crabtree Insulation Company, Miami, Florida

Crabtree Insulation Company had the contract to install all pipe and ductwork insulation in the new 405-room addition to Fontainbleau Towers, Miami Beach. Choice of materials was given to the company.

Mr. Crabtree asked his superintendent what materials he felt should be used, and was advised that the men preferred PPG Fiber Glass Insulation Products because they were easier to handle.

As a result, Crabtree Insulation Company used 100,000 ft of PPG Pipe Insulation, 25,000 ft of PPG Neoprene-coated Duct Liner, and 25,000 ft of PPG Duct Insulation in the new Fontainbleau Towers addition.

Mr. Crabtree reports the insulation job went faster and with fewer problems than if other materials had been used. On the basis of this job and other jobs where he had used PPG materials, he would recommend PPG with no hesitation to other contractors.

WANT TOP RESULTS? TRY PPG!

PPG has a wide range of fiber glass thermal and acoustical insulation products that speed installation, provide excellent insulating properties, give long service life with little or no maintenance. If you haven't tried them, get full information by contacting your nearest PPG Fiber Glass Sales Office, or by writing *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.*

FIBER PPG GLASS PITTSBURGH PLATE GLASS COMPANY

Sales Offices: Atlanta, Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Houston, Kansas City, Louisville, Los Angeles, Miami, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, San Francisco, St. Louis and Seattle.

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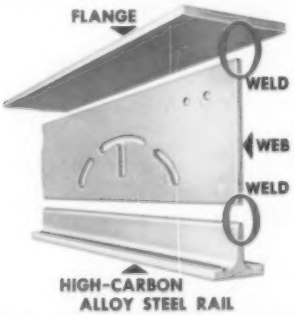
CLEVELAND TRAMRAIL
ANNOUNCES

TARCA TRACK

A MAJOR TRACK DEVELOPMENT FOR OVERHEAD MATERIALS HANDLING

Continuous automatically–controlled welds

Flange, web and rail joined by continuous automatic welds assure reliability.



Hard, raised, long-life treads

Rail especially rolled of high-carbon alloy steel for maximum durability. Treads are extra hard, raised, flat and smooth—for easy load movement—prevent peening—longer wear.

another exciting "first"

An outstanding advancement in a long series pioneered by Cleveland Tramrail to make it the leader in the overhead materials handling equipment industry. An entirely new track that had to be great to be better—result of years of research.

a far better track

Balanced design with parts proportioned exactly to provide maximum strength with minimum weight. Greater rigidity to withstand severe working conditions.

easier, faster to erect

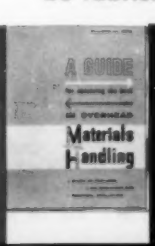
Straight, true, smooth. All dimensions held to greater accuracy. Tarca Track matches with existing Cleveland Tramrail installations.

large range of sizes

10 standard sizes from 8" to 20" deep. Special sizes can be fabricated for unusual applications.

Ask for this helpful booklet—No. 2032

Covers all major features the buyer should know about overhead materials handling equipment. Has complete story on Tarca Track. Contains detailed equipment specifications and handy proposal evaluation form.



CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
5899 EAST 284th STREET · WICKLIFFE, OHIO

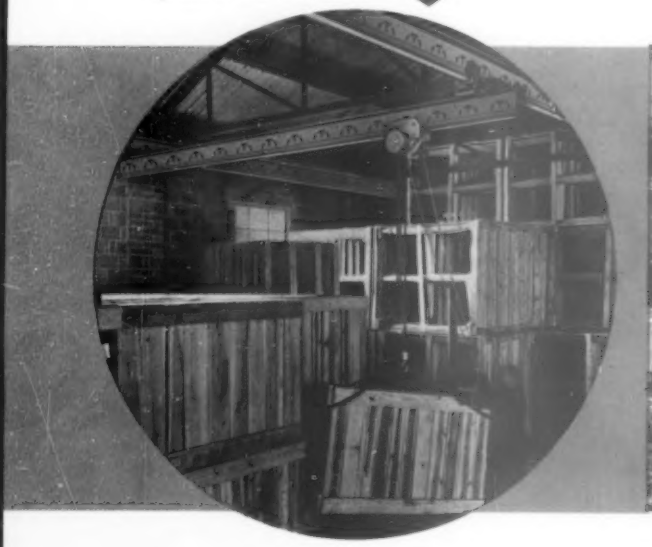
Most Installations of Cleveland Tramrail Equipment pay for themselves within one or two years.

Trade—mark of durability and strength —punched into all Tarca Tracks.

One of the more recent important materials handling developments initiated and engineered by Cleveland Tramrail for the Wire and Rod Industry is the hydraulically-operated grab for storing coils in vertical piles. This device picks up several coils at a time and works in either vertical or horizontal positions.

Simple inexpensive hand-propelled Cleveland Tramrail cranes are filling a mighty important need in a vast number of places. For instance, in this warehouse of a glass distributor, heavy awkward cases are handled by one man and piled high, thereby utilizing the storage space to the maximum.

Cleveland Tramrail gantry cranes have long been popular because they increase efficiency of many local handling situations. They will operate under overhead cranes without interference. Tramrail gantries are built in many types and sizes, with manual or electric drives.



Your Cleveland Tramrail Sales Engineer is Qualified to give you the Complete Design and Application Story on This Revolutionary

NEW TARCA TRACK

Cleveland Tramrail is represented by competent, experienced engineers in all principal cities of the United States and Canada. Contact address on other side.

1—Printed in U.S.A.

IF YOU CAN ANSWER "YES" TO TWO OF THESE QUESTIONS...

1. *Does your plant average one or more workers per 300 square feet?*
2. *Do you pay annual wages, including benefits, of $25 or more per square foot?*
3. *Does one out of seven of your workers quit every year?*
4. *Does labor amount to 25% or more of your total manufacturing cost?*

FACTORY AIR CONDITIONING SHOULD PAY OFF FOR YOU!

Why do the questions above relate so directly to the profitability of air conditioning? Let's discuss each of them in order:

1. The higher the concentration of workers in a given area, the less the cost of air conditioning per worker and the greater the return on the investment as air conditioning increases worker productivity. Experience shows that air conditioning pays off quickest in plants of 300 square feet or less per worker.

2. Where labor rates are high, concentration of workers is less important. For example, the return on an air conditioning investment will be half again as much in the case of $3.75-per-hour workers as it is for $2.50-per-hour workers.

3. Voluntary labor turnover usually amounts to 15% annually. Many studies show this figure is substantially reduced by air conditioning.

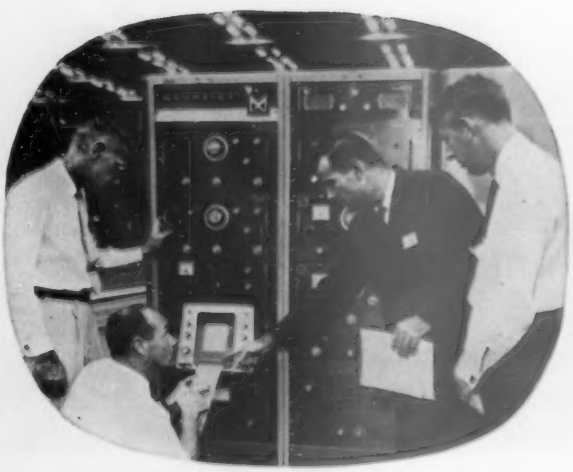
4. Wherever labor represents a large share of the cost of a product, the profit potential of air conditioning is high—regardless of worker concentration or annual wages per square foot.

Did you answer "yes" to two or more? If so, you owe it to yourself to make an air conditioning investment analysis of your plant. Your engineer or consultant can do this in a few hours by using the Carrier Investment Analysis. Write for a copy to Carrier Air Conditioning Company, Syracuse 1, N. Y. In Canada: Carrier Air Conditioning Ltd., Toronto.

Carrier Air Conditioning Company

FOR RELIABILITY CONTROL...
FOR BETTER DESIGN...

PLAN NDT* IN YOUR R&D, ENGINEERING, PRODUCTION



Planned testing of critical tubing ⅛" to 6" O.D. with eddy currents. **Magnatest FW-400 is used here for both research and production testing of stainless steel and aluminum tubing. It is one of a broad line of Magnatest units testing** nonmagnetic tube, rod and wire—for **seams, inclusions, voids,** concentrated porosity, embrittled areas, **slivers, laps, etc. Defects are reported** on the scope and/or other **readout, at mill speeds if necessary.**

Photo courtesy GENERAL DYNAMICS/FORT WORTH

Planned testing of rocket motor solid fuel chambers. **This specially researched and developed Magnaglo unit provides multi-directional magnetization for positive detection of all crack-type defects. In designing specialized-purpose units like this for inspection of highly critical components and parts, Magnaflux draws upon an impressive background of hundreds of thousands of man hours spent in its own R & D, and experience in planned engineering of test equipment for virtually every industrial need.**

NDT*: Nondestructive Testing works best and saves you most when it is planned for at the beginning—not added at the end.

NDT can help assure reliability of your finished products, of course. But your greatest benefits come when adequate testing considerations are introduced as early as possible in the R & D and design stages, with more thought given to filling missions than filling arbitrary specifications. It is no longer enough to keep defective parts and machines off the launching pad, or out of the airplane—or even out of the production line. Test practices must consider the need of the end use of the item, using the best test method, regardless of its type.

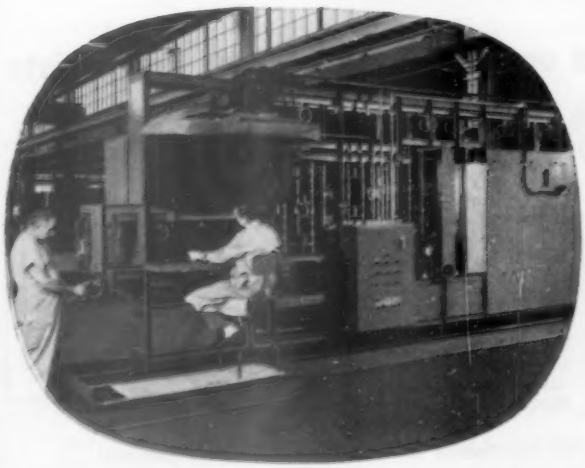
Such benefits in reliability—and production savings, too—can be realized every day, with Magnaflux Test Systems planned for and used at every stage from first concept to full production testing. Whether for large volume, or few-of-a-kind critical parts, or prototypes, Magnaflux offers you the widest variety of different test systems and methods.

A few typical examples are shown here. Many others could be. For your own requirements—however commonplace, critical or specialized—there is usually a Magnaflux Test System. Call your Magnaflux Field Engineer—or write Magnaflux Corporation, 7316 W. Lawrence Avenue, Chicago 31, Illinois.

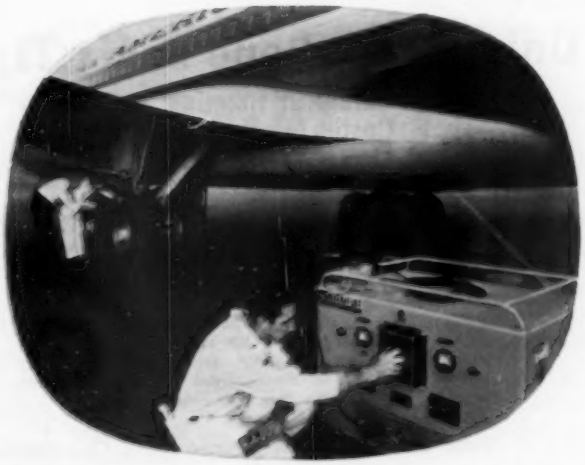
MAGNAFLUX CORPORATION
TEST SYSTEMS

A SUBSIDIARY OF GENERAL MILLS

MAGNETIC PARTICLE • FLUORESCENT PENETRANT • ULTRASONIC • EDDY CURRENT • STRESS ANALYSIS RADIOGRAPHY • DYE PENETRANT MAGNETIC FIELD MEASURE • THERMOGRAPHIC



Planned testing of bearing cages. This is a specialized, automated Zyglo Fluorescent Penetrant System with which one man tests up to 375 nonferrous bearing cages per hour for cracks, porosity or leaks. It includes complete conveyorized handling and programmed processing, custom engineered and built by Magnaflux. Parts tested range from ¾" I.D. to 10" O.D. Twenty-six different Zyglo Penetrants have been developed by Magnaflux to produce precise, 100% reproducible results, assure sensitivity to meet all needs.



Planned apron check of a jet liner's main gear is made with Magnaflux KCH-3D and black light. Such tests are routine to assure safety on major airlines serving throughout the world. Magnaflux units like this are versatile, and are also used in all sorts of industrial maintenance operations as well as in production testing of large castings, structural weldments, etc. Photo is of Pan American Boeing 707 at Idlewild Airport, New York.

Putting an ill-fitting set of harness on a team was all it took to cause an old time horseman to commit mayhem.

Maiming of persons can also result from haphazard harnessing of hoisting equipment horsepower to load.

The patented 9-part machine-braided wire fabric construction of Union Tuffy Slings gives you strength you can trust on any load for which the various sizes and types are rated. It also gives you hard-to-kink and easy to unkink flexibility to enable your men to sling loads faster, easier and with greater safety.

Put Union Tuffy Hoist Line On Your Team

Hook Union Tuffy Slings onto Union Tuffy Hoist Lines and your hoisting equipment is harnessed to handle more loads faster and for longer service.

Union Tuffy Hoist Line is a special wire rope construction with the right combination of strength, flexibility and toughness for greater safety and service life in its specific range of uses on overhead cranes, derricks, stiff leg and mobile cranes.

Union Wire Rope Tuffy Tips on safe use of Slings and Hoists

Safety in Hoisting Saves Costly Injuries

During a recent 12-month period, lost-time back injuries reported in one state (California) totaled 32,643. Lost-time injuries caused by strain or over-exertion: 24,639.

A high price to pay—in misery and money—for lifting, pushing or carrying loads. Medical aid and compensation costs of materials handling accidents run far into the millions every year. Proper hoisting equipment, properly used and maintained, is one important answer to this problem.

Free! Two Valuable Tuffy Handbooks

1. "Tuffy Tips." Gives many other safety hints. Also tells how proper fittings and correct use of slings and wire rope can lengthen service life. Chock-full of do's and don't's to save money, time and work.

2. "Tuffy Sling Handbook." Tells all about slings from A to Z. Contains helpful data on the selection and use of slings—types, dimensions, weights, fittings, rated loads, safety-approved signals.

5-61

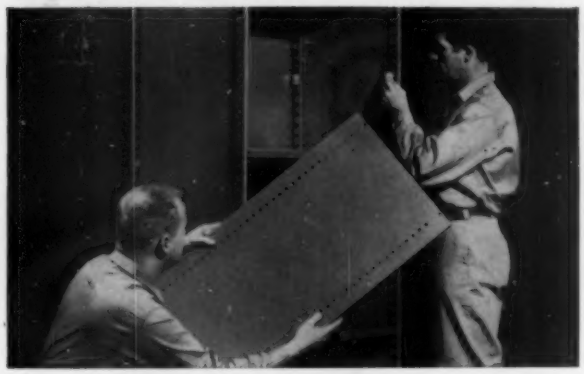
Write Union Wire Rope, Armco Steel Corporation, 2234 Manchester Avenue, Kansas City 26, Missouri

ARMCO Union Wire Rope

For more facts Circle 432 on Reader Service Card

COSTS LESS TO BUY AND ERECT!

New one-piece shelf clips lower shelving costs—can be installed without tools. Made of heavy gauge steel, the clips are strong enough to support heavy loads.



Up to 50% saving on erecting costs. This standard 8-shelf unit was erected by 2 men in less than 10 minutes, thanks to the new one-piece shelf clips.

GIVES GREATER ADJUSTABILITY!

New clip-type shelves go in and out without tilting. Shelves need not be unloaded to be repositioned. What's more, no tools are required to make shelf adjustments.

Shelves are adjustable on 1½" centers. This feature, plus the beaded front post, eliminates wasted space—gives more useable storage capacity in less floor space.

HALLOWELL

CLIP TYPE *ERECTOMATIC*® SHELVING

CHECK THESE OTHER ADVANTAGES:

- Interchangeable with regular Erectomatic shelves and shelf supports.
- New clip fits flat against post—does not steal storage space.
- New, stronger shelves. Corners are lapped and spot welded.
- Available on the most liberal lease plan in the industry.

COLUMBIA-HALLOWELL Division
JENKINTOWN 11, PA.•SANTA ANA, CALIFORNIA

SPS

where reliability replaces probability

MAIL COUPON FOR FREE CATALOG

COLUMBIA-HALLOWELL Division SPS
Jenkintown 11, Pa.

Please send me catalog on new Hallowell Clip-Type Erectomatic Shelving

Name_____

Company_____

Address_____

City_____ Zone____ State_____

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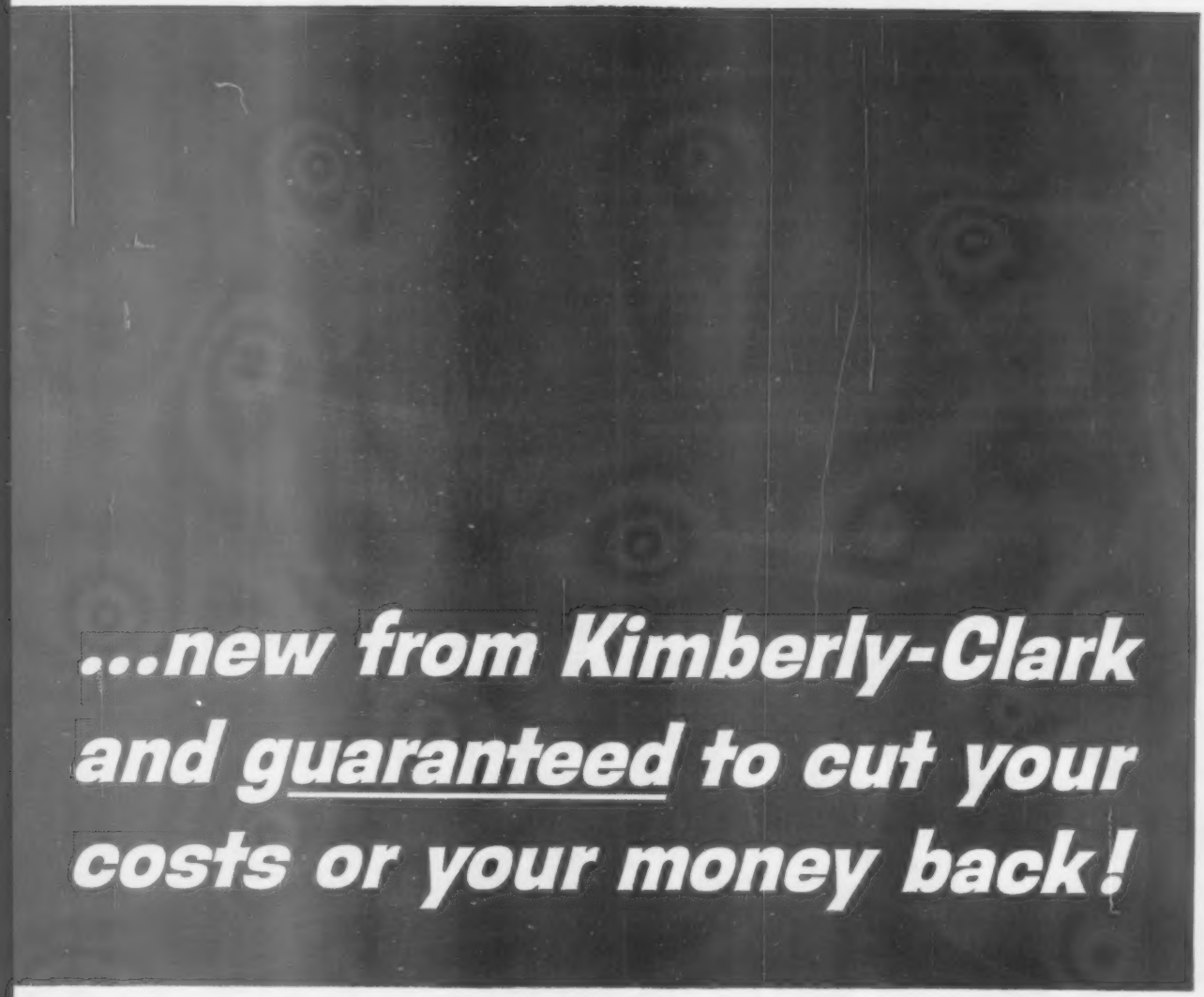
For more facts Circle 434 on Reader Service Card



Your towel costs must come down or your money back!

Kimberly-Clark's 1-month guaranteed cost-cutting plan will prove to you that KIMTOWELS can reduce wiping costs. Here's how the plan works: you order a month's supply of Kimtowels. Use them in your entire plant (or in a single department) just as you would cloth wipers. At the end of one month, if your wiping costs haven't gone down, we will gladly refund the cost of the Kimtowels. Fair enough? Send coupon today.

- Look, feel, perform like cloth!
- Re-usable—like cloth!
- Far more economical than cloth!
- Strong, rugged—wet or dry!

plus—no rental; no collecting; no sorting; no storage; no records; no pilferage!

Kimberly-Clark Department No. F-91, Neenah, Wisconsin

At no obligation to me, please rush information on the "GUARANTEED COST-CUTTING PLAN."

Name.....

Firm.....

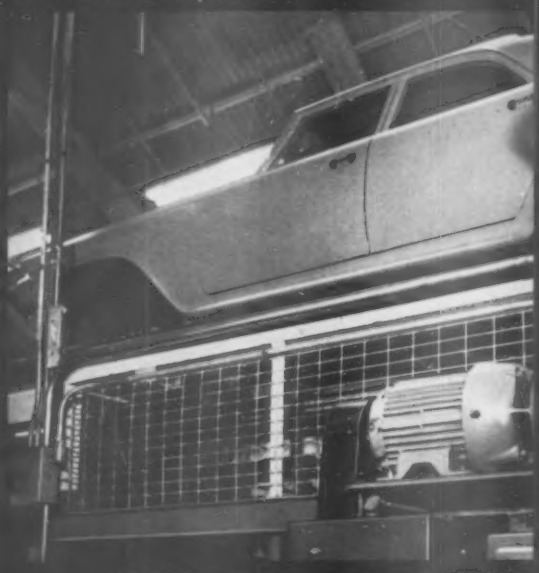
Street.....

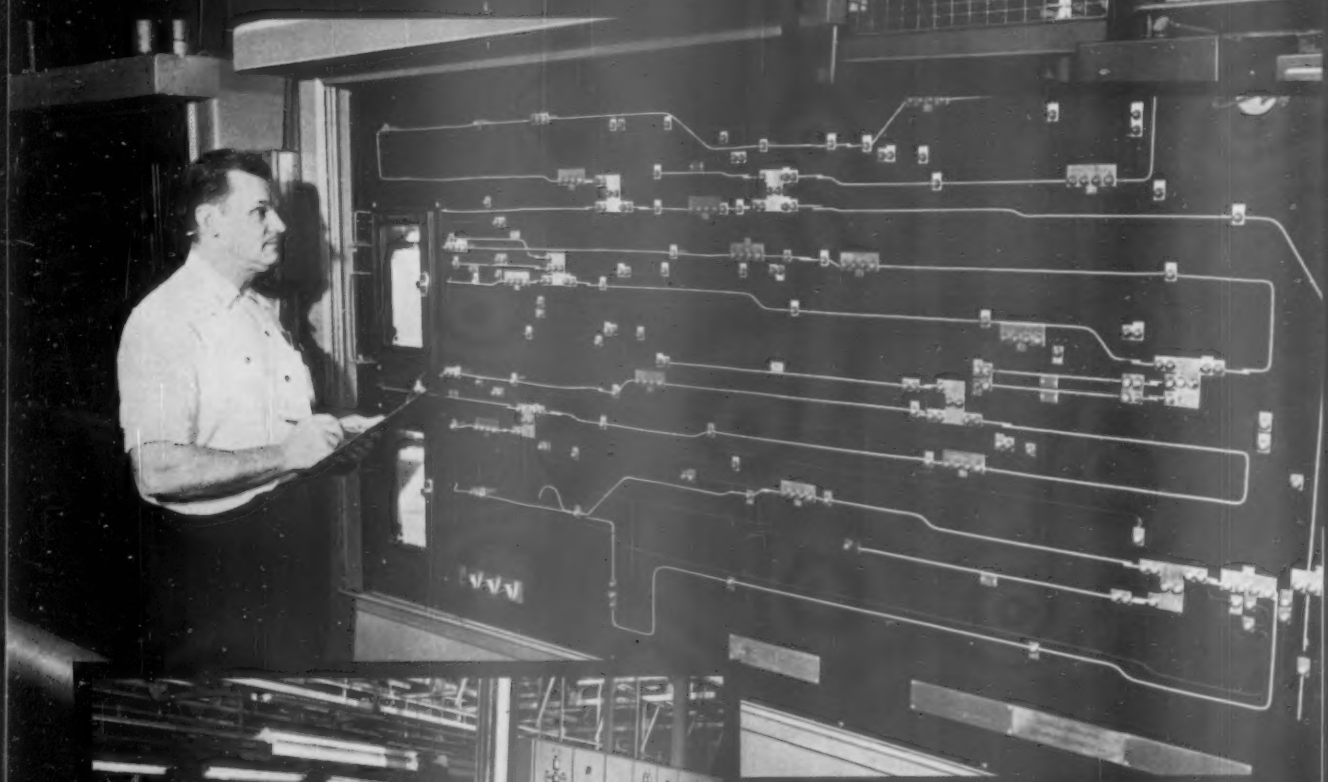
City.....Zone.....State.....

Louis Allis engineered systems include:

1. A Louis Allis drive powers this transfer table, shifts one body per minute into position for paint line after coming out of prime coat drying ovens.
2. This 3 dimensional area control center monitors conveyor operations. Any type of production interruption is quickly revealed and identified by signal light indication. Recorders provide a permanent daily record of each conveyor's operation.
3. A bank of Louis Allis controllers regulate the drives powering the mating line where unitized body, stub frame, engine assembly and running gear are assembled. Here, a Plymouth convertible comes off the assembly line.
4. Louis Allis controllers coordinate the intricate assembly of side-gate framing fixtures and underbody just prior to welding. Three components arrive from three different locations at precisely the same moment.

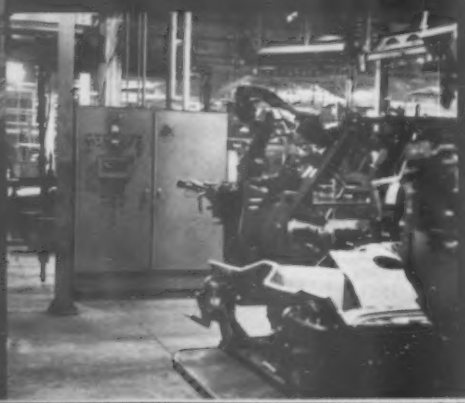
1. Automatic transfer station



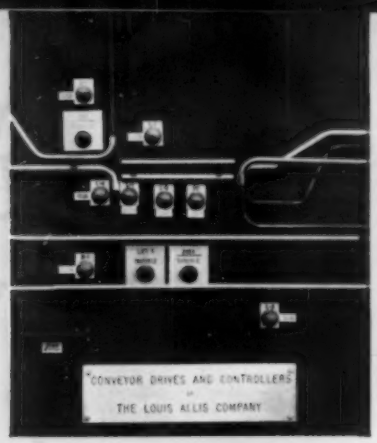


2. Area control center

3. Pre-final assembly area



4. Initial body assembly



Engineering news from Louis Allis

LOUIS ALLIS engineered systems automate Chrysler assembly lines

An automobile assembly line is a materials handling complex of movement and synchronization. Feeder lines joining the main-line must deliver components on time — and in perfect synchronism. Still, the system must be flexible enough to accommodate speed changes when desired.

The Plymouth assembly plants in Detroit and St. Louis are models of this type of automation . . . and electrical components for the materials handling systems were custom-engineered by Louis Allis. L.A. systems engineers worked with Plymouth engineers to map the flow sequence. Louis Allis provided the adjustable speed drives and precision controls to operate the systems and supervised the installation. The result: integrated, automated systems that eliminate time loss, manpower waste, and excess materials handling costs.

Synchronized conveyors operate at pre-set speeds by following built-in master job-rate controllers. The system provides for automatic, position-perfect transfer of body components from one conveyor to another. A three-dimensional area control center monitors and records all conveyor operations.

If your plans call for automation, contact Louis Allis for systems engineering assistance — and single-source responsibility of drive and control design, manufacturing, and service. Call the Louis Allis District Office nearest you, or write to The Louis Allis Co., 432 E. Stewart St., Milwaukee 1, Wis. Ask for Bulletin 2900.

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

LOUIS ALLIS

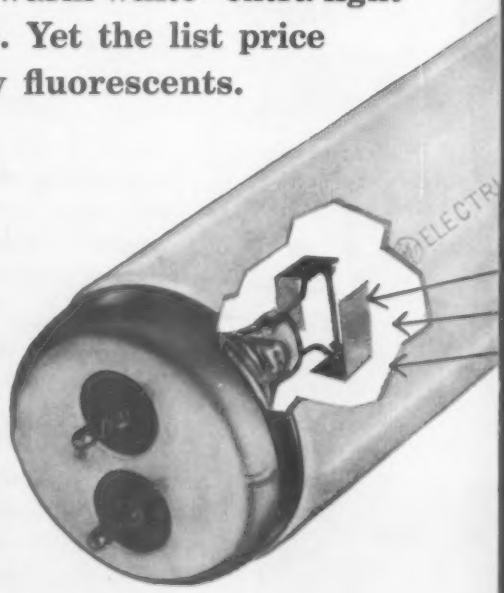
A59-237

For more facts Circle 435 on Reader Service Card

General Electri
brightest 40-wat
fluorescent ever

Here's money-saving news for you 40-watt fluorescent users. Gener Electric's NEW F40 gives you a 7% bonus in light at no extra cos With it you can get your desired lighting level with fewer lamps ar fixtures. Or you can increase your existing lighting level witho spending a single extra penny for lamps, fixtures or electricity.

Only General Electric offers you this bonus in standard 40-wa "white" fluorescent lamps. The G-E NEW F40 is rated at 3100 lumens in popular cool white, 3250 in white or warm white—extra light worth 15¢ to 30¢ a lamp to most users. Yet the list price for this lamp is the same as ordinary fluorescents.



NEW F40 ONLY $1.30 LIST

FACTORY

announces the cool-white made...

The bonus of light you get with General Electric's *NEW F40* is made possible because of these G-E Premium 3 construction features:

1. **G-E wattage-miser electrode helps convert power ordinarily lost in the cathode into useful light—free.**
2. **New, more efficient gas mixture.**
3. **New electronically screened bonus-phosphor.**

And all these light producing features are available for the first time in a lamp that sells for the same price as ordinary fluorescents—only $1.30 for the popular cool white, $1.35 for other "white" colors.

Designed for both Rapid Start and starter-type circuits, the *NEW F40* has a life rating of 7500 hours for most circuits (6000 hours for systems installed before 1954). To get 7500-hour life in pre-'54 circuits, F40/54 lamps are available. They give the same light as ordinary 40-watt fluorescents (2900 lumens) and list for the same price ($1.30 in cool white). General Electric Co., Large Lamp Dept. C-122, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

DO YOUR FASTENING METHODS MEASURE UP TO

THIS ONE?

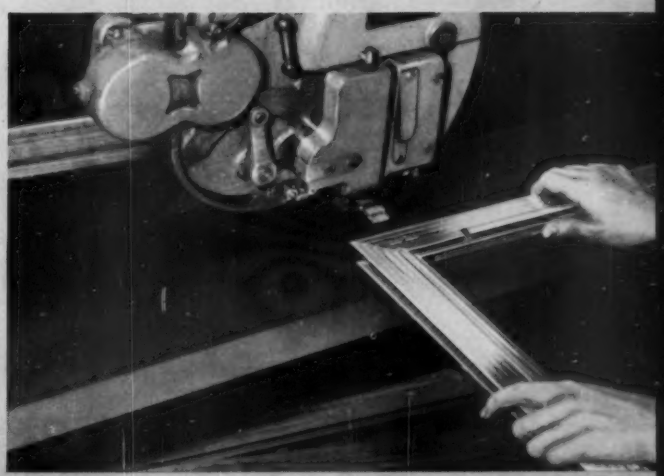
We've yet to uncover a fastener that matches the cost-cutting talents of Acme Steel Wire Stitching

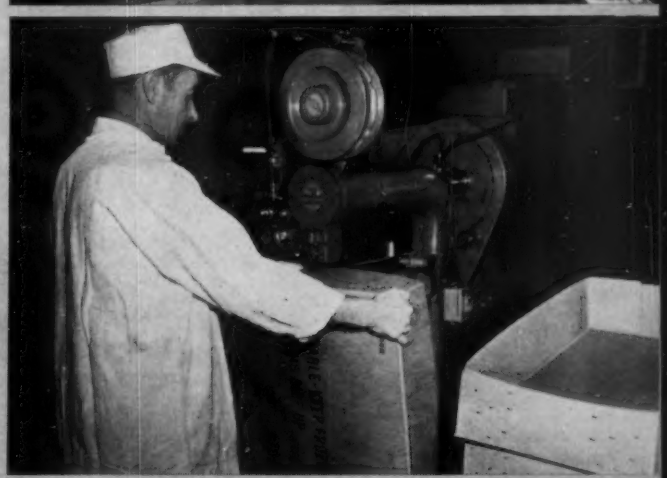
Are your present fastening methods producing with lowest material cost, fastest operating speed, highest quality workmanship? Investigate Acme Steel Wire Stitching . . . to be sure.

This method promotes such substantial savings, it is outmoding conventional stapling, riveting, spot welding, threaded fastening and adhesion methods in a host of assembly operations.

A high speed Acme Steel Wire Stitcher takes wire directly from a coil—cuts it . . . forms it into proper size "staples" . . . then drives thousands of them without a pause for reloading. Result: pre-punching, tapping, drilling, hole aligning and screwdriving steps are completely eliminated. You can join many combinations of metallic or non-metallic materials with uniformly high fastening strength and speed. Material and manpower savings are tremendous.

Naturally, wire stitching is no cure-all for every industrial assembly job. But, an objective analysis by men who know will tell if this advanced method is feasible in your operation. Ask your local Acme Idea Man for recommendations. Or, send samples of materials you wish fastened to: Wire Stitching Laboratory, Acme Steel Company, Dept. FACP-91, 135th Street & Perry Avenue, Chicago 27, Illinois.





WIRE STITCHING'S TALENTS EXTEND TO MANY FIELDS
Acme Steel Wire Stitchers are closing and reinforcing corrugated boxes and containers of every variety . . . binding books and literature . . . bagging, carding and labeling packages.

ACME STEEL

IDEA LEADER IN

STITCHING · FRAMING · STRAPPING

FALK INTRODUCES 2 NEW SERIES OF VERSATILE SPEED REDUCERS

Designed to serve industry's current and future requirements

Type YB
Right Angle Horizontal
(write for Bulletin 2100)

Type Y Parallel Shaft
(write for Bulletin 1100)

Parallel Shaft and Right Angle Horizontal Reducers cataloged thru 1,570,000 lb-in. torque at low speed shaft ...larger units upon request. Ratios 1.84 thru 292 to 1 for parallel shaft; 5.06 thru 1207 to 1 for right angle horizontal

These new units are probably the most thoroughly engineered speed reducers on the market today. Final designs based upon years of development study and a background of 50 years experience make these units as dependable as the name "FALK". A few of their many features are...

PINPOINT APPLICATION COVERAGE Wide choice of sizes and ratios permits the most economical selection of a correctly rated unit for each application. In each series of parallel shaft and right angle reducers, cataloged sizes range up to 1,570,000 lb-in. torque at the (11 inch dia.) low speed shaft. (Other standard designs to 25,000,000 lb-in. torque; custom designs for higher capacities.)

UNMATCHED VERSATILITY The "Basic Y" speed reducer design permits economical modification to meet a multitude of specific requirements. Smooth, flat surfaces simplify mounting of motor brackets, backstops, brakes, and any number of other accessories.

RUGGED HOUSINGS Sturdy housings not only provide maximum rigidity to maintain proper alignment of gearing, but also have the strength to support heavy overhung loads and withstand accidental blows.

DEPENDABLE FALK GEARING Gears are selected with the proper proportions and hardness to provide the optimum combination of maximum durability and strength for high shock as well as uniform loads.

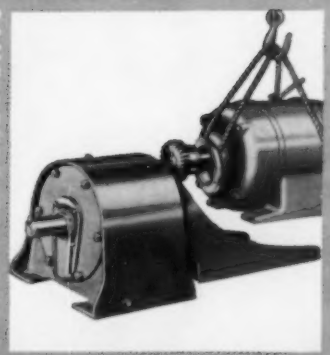
BEARINGS TO SUIT THE OVERHUNG LOAD Standard reducers can meet custom-built requirements with optional stock bearings and shafts (at only a nominal extra charge.) Maximum overhung load capacities are so great that for some conditions, still within the capacity of the reducer, extra strong supporting foundations and bolts must be provided.

DOUBLE GEAR LIFE Standard double ended shafts can be reversed end for end to bring into contact the unused surfaces of the gear teeth for twice the normal gear life.

SEALS FOR ALL CONDITIONS Standard equipment oil seals assure oil-tight and dirt-free gear units for normal applications. Standard abrasive and moisture-resistant seals available upon order.

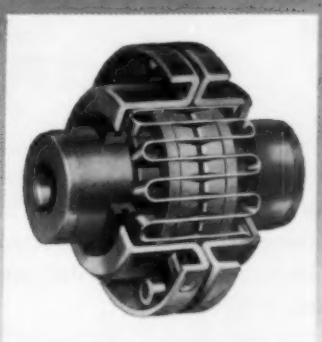
THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN
MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS
Representatives and Distributors in most principal cities

SOME OTHER MEMBERS OF AMERICA'S FIRST FAMILY OF POWER TRANSMISSION PRODUCTS



ALL-MOTOR MOTOREDUCERS

SHAFT MOUNTED DRIVES



STEELFLEX COUPLINGS

A GOOD NAME IN INDUSTRY

FALK, ALL-MOTOR, and STEELFLEX are registered trademarks

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LOST! a gold mine of control guidance for executives

All of the reports and statistics in the world have no value if you can't digest them and apply the information while it's fresh. That's why astute executives may use RCA Electronic Data Processing Centers to analyze vital inventory data quickly and accurately.

Take inventory, for example. Here, modern electronic data processing can give you constant coordination between sales and manufacturing. You minimize the risk of producing too much, or too little.

STRICTLY CONFIDENTIAL—All information handled through RCA Electronic Data Processing Centers is treated in absolute privacy. You can rely on RCA . . . The Most Trusted Name in Electronic Data Processing.

Specifically, with information you already have available, your nearest RCA EDP Center can help you with:

- **Accounts Receivable**
- **Accounts Payable**
- **Sales Analysis**
- **Assistance in Production Scheduling**

RCA EDP Centers are strategically located from coast-to-coast. For information write RCA EDP Service, Building 206-1, Cherry Hill, Camden 8, N.J., or phone WOodlawn 3-8000, Extension PY-5041.

RCA®

The Most Trusted Name in Electronics

RADIO CORPORATION OF AMERICA

Photo courtesy Jones & Laughlin Steel Corp., Pittsburgh

FOR EVERY APPLICATION, THERE'S ONE CRANE OUTSTANDING . . . P&H!

This wide-span P&H overhead crane is equipped with a trolley-mounted cab so the *operator stays right above the load at all times.* He can clearly see to move and load coils of steel or stacks of plate with unquestioned safety and accuracy. In addition, the P&H Hook-a-Weigh electronic crane scale, in combination with a motorized hook, enables the crane operator to both weigh loads and rotate them safely and precisely. This means faster shipping and easier spotting.

Here, as in every P&H crane installation, Harnischfeger engineers have carefully considered all the factors that affect performance. P&H cranes are built from standard components —yet are individually engineered for the job. Your particular material-handling requirements are integrated right into the overall design. Result: Costs are kept low—but performance is unbeatable.

Whether you need 3-ton or 300-ton capacity, it will pay you to find out more about P&H job-engineered overhead cranes . . . and what they can mean to your plant operation. Get a helpful recommendation on your next crane inquiry — send it to Harnischfeger!

P&H Hook-a-Weigh transforms the crane hook into a sensitive, accurate electronic scale. It easily combines weighing and handling operations — eliminates floor-mounted scale equipment. It also maintains an accurate, permanent record on tape or card. Can be used on any crane — capacities up to 200,000 lbs. Another useful feature, the motorized hook, can be combined with Hook-a-Weigh or offered separately, to enable the crane operator to rotate the load at the push of a button, eliminating in many cases, the need for floor help.

Offices in major cities... see Yellow Pages

HARNISCHFEGER
Milwaukee 46, Wisconsin

P&H
OVERHEAD CRANES

Fumes, dust, and heat can't stop P&H Hevi-Lift® Hoists

This P&H Balanced Design Hevi-Lift hoist lives in a world of smoke, heat, fumes, and dust. Yet it continuously provides the precision control and unquestioned dependability that is so vital to modern foundry operations.

Buckets of hot metal are spotted over the molds with pinpoint accuracy every time. Five-speed, push-button control is positive, and smooth . . . no hazardous "sloshing" or spilling.

P&H Hevi-Lifts shrug off such punishment because their standard construction is totally enclosed — to permit work under all possible atmospheric conditions. There are no "special" modifications needed as with other hoists.

Every part of these Balanced Design hoists has been balanced or matched with every other part for maximum strength, temperature, and performance characteristics. The result? Balanced Design Hevi-Lifts stand up far longer under heavy-duty cycles on jobs like this with far less maintenance than any other hoist made today.

Regardless of your needs, this kind of hoist performance can measurably improve your material handling — in speed, safety, and lower production costs. Send for bulletin H-55. Dept. 237, Harnischfeger Corporation, Milwaukee 46, Wis.

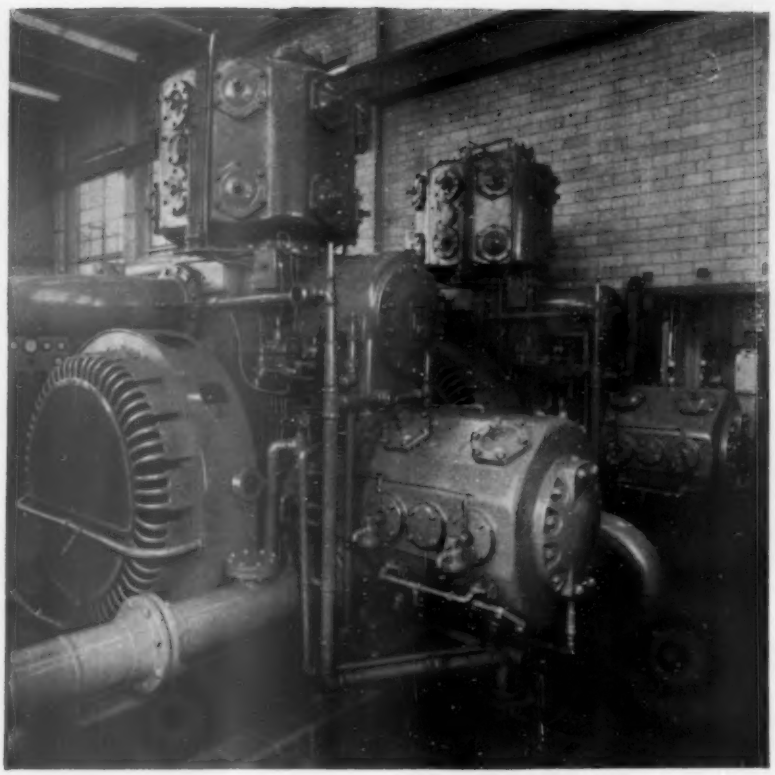
HARNISCHFEGER

Milwaukee 46, Wisconsin

P&H

ELECTRIC HOISTS

Offices in major cities... see Yellow Pages



IN I-R COMPRESSORS,

TIME TELLS

THE DIFFERENCE

In these two XLE compressors, 21 Channel Valves have operated

45,482 HOURS

with no parts replaced!

The two Ingersoll-Rand XLE air compressors shown above are installed at a large midwestern automotive plant. They were started up in May, 1951, and at this writing have totalled 45,482 hours, mostly at 16 to 24 hours a day.

Of the 28 Channel Valves (14 per unit), 21 have operated full time with *no repairs*, merely being cleaned once a year. Each of the other seven valves had only one channel and spring replaced in all this time, during the scheduled inspection period. And all the valves are operating with their seat plates still on the first side—when the plates are turned over, their life will be doubled.*

The *extra value* that's built into every type of Ingersoll-Rand compressor pays off with *long-run economy*. Reduced maintenance and attention, over many years, mean long-range savings in the cost of air power. Ask your I-R representative for more information on the world's most complete line of compressors—in reciprocating, centrifugal, axial-flow, rotary and thermal types. There are units from ½ to 25,000 hp, for pressures from one micron to 125,000 psi. Call him now.

***Only I-R compressors have Channel Valves**
Known for high efficiency, quiet operation and exceptional durability. Entirely different. Each valve is a combination of rigid stainless-steel channels and bowed leaf springs, with trapped-air spaces which cushion action, prevent impact.

Ingersoll-Rand
111A1 11 Broadway, New York 4, N.Y.

The World's Most Comprehensive Compressor Experience

◀ For more facts Circle 441 on Reader Service Card

For more facts Circle 442 on Reader Service Card

Architects and Engineers:
Fellheimer & Wagner, New York

General Contractor:
Southeastern Construction Co., Charlotte, N. C.

Mechanical Contractor:
B. & G. Olsen Co., Richmond, Va.

Engineering Building

Development Laboratory

Where Controlled Environment Counts, It's
JOHNSON PNEUMATIC CONTROL

... at Union Carbide Technical Center, for example

The new Union Carbide Technical Center in South Charleston, W. Va., is one of the most modern R&D facilities in industry today. It includes 12 buildings where over 1000 scientists and engineers carry out important assignments for Union Carbide Chemicals Company, Union Carbide Olefins Company, and Union Carbide Plastics Company.

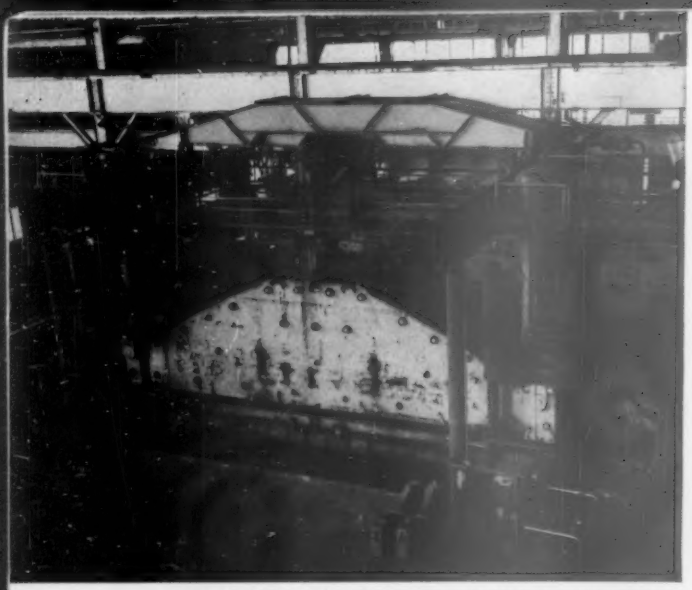
A closely controlled thermal environment is especially important to the Center's operation, being essential to much of the experimental work as well as to the comfort and efficiency of the staff.

Specially engineered Johnson Pneumatic Control Systems help meet both types of demand with equal precision. Whether it's personal comfort in a private office, or special thermal conditions for individual projects in the Development Laboratory, the High Pressure Laboratory, or the Pilot Scale Laboratory buildings, Johnson Control maintains the exact air conditions required at all times.

Johnson Pneumatic Control is applied to all types and makes of air conditioning, heating, and ventilating equipment, and to a wide range of industrial processes. Next time you have a problem of temperature, humidity, or pressure control, investigate the advantages you get from a Johnson System — in performance, dependability, and lifetime economy. Johnson Service Company, Milwaukee 1, Wisconsin. 110 Direct Branch Offices.

JOHNSON CONTROL
PNEUMATIC SYSTEMS
DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

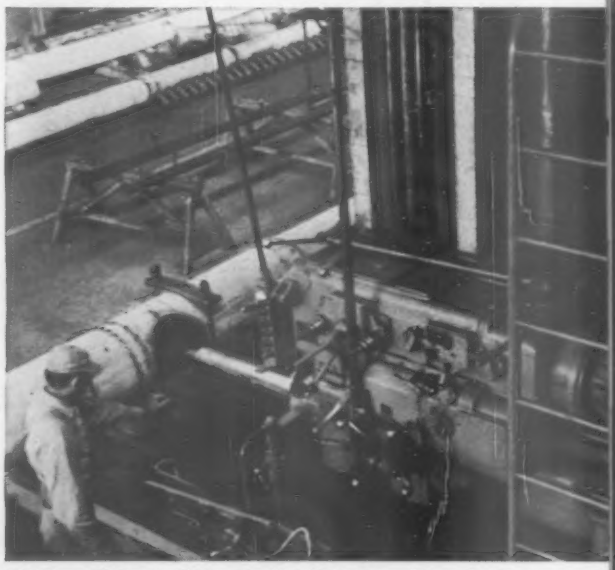
A Johnson Pneumatic Control Center permits centralized supervision and control of air conditioning in the Engineering Building. Pneumatic indicators continuously display temperatures and pressures from all key control points. Remote adjustments may be made without leaving the panel. Selector switches place any system on either manual or completely automatic operation, as desired. In addition, local graphic panels, with temperature and pressure indication, are located in fan rooms adjacent to units. The system makes use of polyethylene tubing for compressed air piping.



Overhead view of 2500-ton press. It forms heavy steel plate for drum shells—up to 7 inches thick, up to 30 feet long. Gulf Harmony 61 is used in the hydraulic system.

Cincinnati Bickford radial drill presses — working on headers. Gulf Harmony 61 is used in column mechanism, drill-head mechanism and main drive gear boxes. Gulf Precision Grease is applied to fittings.

Colburn Vertical Boring Mill—milling a drum head. Gulf Harmony 61 is used in the circulating system for main drive gears; in the reservoir for feed change gears.



Giddings & Lewis 6" horizontal boring machine—boring hole in header. Gulf Harmony lubricates the column slides and screws on this new machine.

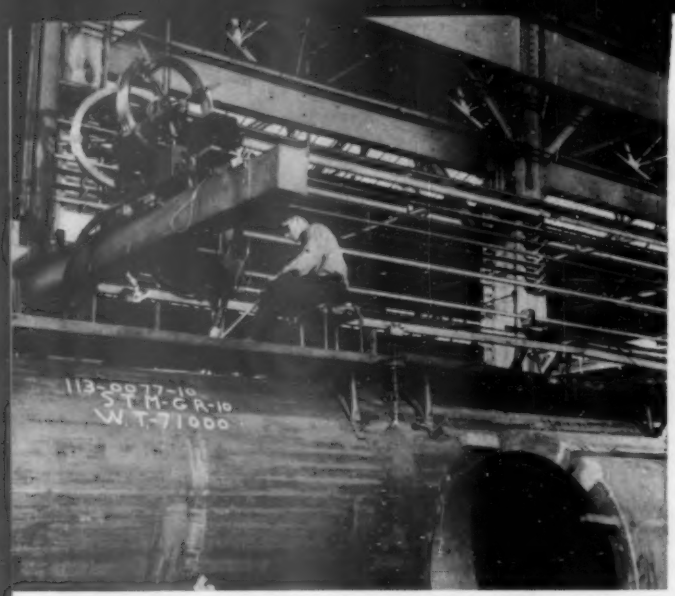
Simplified lube program helps Babcock 16 lubricants to just 7...

The Paris, Texas, plant of Babcock & Wilcox specializes in the manufacture of steam generating equipment. Typical examples: 65-ton boiler drums and 4-ton tube sections.

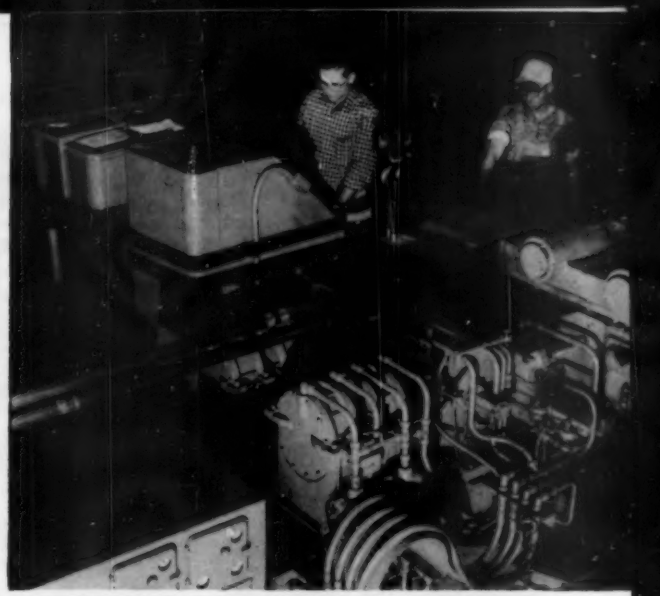
Recently, Gulf Sales Engineers conducted a lubricant survey in this plant. As a result, lubes were reduced from 16 to 7. This reduced the possibility of application errors and simplified ordering, bookkeeping and handling.

"It's important to keep lube recommendations up to date," says C. C. Eagon, Master Mechanic. "We call in lubrication engineers as new machines arrive. And they help us translate the manufacturer's lube recommendations in terms of their oils and greases."

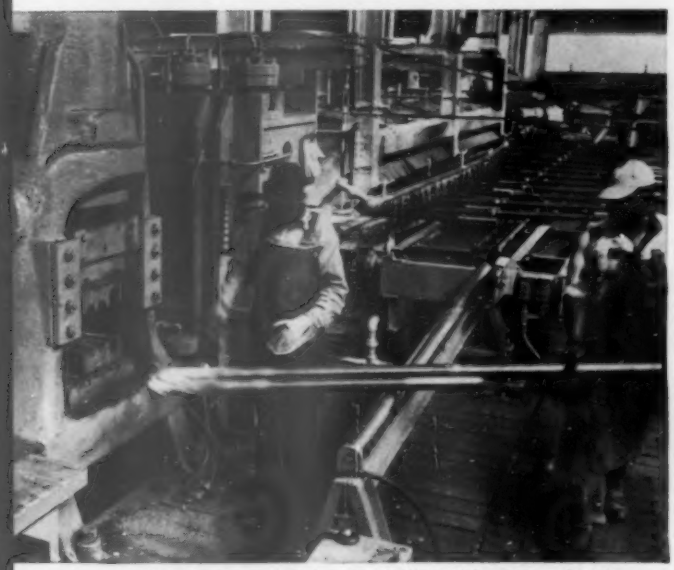
The seven recommended grades are really four basic types of Gulf oils and greases. First, Gulf Harmony® oils—highly stable lubricating oils with excellent water separating properties; inhibited against



Automatic submerged arc welder is used to weld drum halves together, Gulf Precision Grease and Gulf E.P. Lubricant 95 protect bearings and gears of this machine against excessive wear.



Tubes joined together in butt-welder. The hydraulic system reservoir is filled with Gulf Harmony 44. Gulf Harmony 61 is used in milling machine gear box. Gulf Precision Grease lubricates guide shaft bearings.



Sizing press. Tubing is sized in this press after it goes through swedging, upsetting and bending operations. Ways and shaft bearings are lubricated with Gulf Precision Grease, from central greasing system.

Works Manager R. L. Reed (left) talks with Frank P. Mauro, Gulf Sales Engineer. The drums behind them are being shipped to a new power plant in Santos, Brazil.

& Wilcox reduce
GULF MAKES THINGS RUN BETTER!

rust and corrosion. Next, Gulf E.P. Lubricants—used where shock loads and high pressures are factors. These superb lubricants are non-foaming, noncorrosive and extremely stable. Thirdly, Gulf Lubcote®—tough and tenacious. It protects against wear. And it cushions the sliding and rolling of gear teeth. Lastly, Gulf Precision Grease—a general purpose ball and roller bearing grease to satisfy the plant's grease-lubrication demands.

Simplify your lube inventory with versatile Gulf multipurpose lubricants. And see for yourself how Gulf makes things run better! Just call a Gulf Sales Engineer at your nearest Gulf office. Or write for information.

GULF OIL CORPORATION
Dept. DM, Gulf Building
Houston 2, Texas

GULF

For more facts Circle 444 on Reader Service Card

"We're very pleased with this Sylvania lighting installation," states John Haas, Supervisor of Electrical Engineering at Johnson & Johnson's New Brunswick plant. "Our production facilities have a cleaner appearance. We maintain our equipment easier and with greater safety. And our employees are much happier working under this new lighting."

SYLVANIA Lighting FIXTURES
Specify with Confidence

SYLVANIA LIGHTING FIXTURES . . .

First Aid for Production and Maintenance at Johnson & Johnson

At Johnson & Johnson's New Brunswick, N.J. plant—the home of Band-Aid Adhesive Bandages—clean surroundings, fast inspection and ease of mechanical maintenance are essential.

To maintain high efficiency in the manufacturing, processing and packaging of Band-Aid Plastic Strips, Johnson & Johnson recently installed new Sylvania industrial fixtures using Sylvania VHO Powertube lamps.

As a result, this production area now has 150 footcandles of quality illumination . . . and it was obtained at reasonable cost.

Sylvania's industrial fixtures using 1500 ma lamps have led to increased production, less waste and better overall efficiency in many plants.

If *your* production figures are not what you expect, take a close look at your lighting. And look to Sylvania fixtures to solve your lighting problems.

VITAL STATISTICS
Johnson & Johnson, New Brunswick, N.J.
Fixture Type—Sylvania 1500 Ma Industrial Units (Slotted Porcelain Reflector—10% upward component)
Lamp Type—Sylvania F96T12/CW/VHO (1500 ma)
Mounting Height—14'
Fixture Spacing—10'
Average Illumination—150 Footcandles

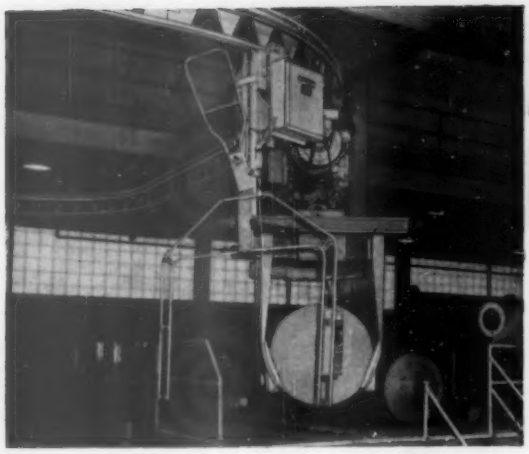
SYLVANIA LIGHTING PRODUCTS
A Division of SYLVANIA ELECTRIC PRODUCTS INC.
One 48th Street, Wheeling, West Virginia

SYLVANIA

SUBSIDIARY OF
GENERAL TELEPHONE & ELECTRONICS

GENERAL SYSTEM FACTORY

For more facts Circle 445 on Reader Service Card



AUTOMATED MONORAIL for today & tomorrow

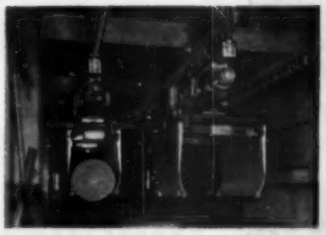
As companies grow and expand their production facilities, the handling of materials becomes more complicated and costly. Often, methods that were once satisfactory become inefficient and can no longer keep pace with production requirements. Time and again, a Louden Monorail Handling System has proved to be the perfect answer.

Recently, in the world's largest paper mill at Savannah, Georgia, a new paper machine went into operation increasing production to 2,400 tons of paper and board per day. This would have further burdened an already overloaded roll handling system. However, a Louden Selectomatic Handling System that was installed as part of the expansion program now automatically transports rolls of paper over approximately one mile of monorail track. The carriers pick up a roll of finished paper at any one of seven paper machines and completely unattended, choose their direction, raise, lower, open or close their grab and deliver the roll to shipping or storage.

A Louden Selectomatic Handling System can do many things. It can automatically transport materials from one point to another anywhere in or about your plant, and select the shortest and most direct route. It can travel from floor to floor, building to building, opening and closing doors. It will stop accurately at one or more destinations, perform a wide variety of functions, and return empty carriers to point of origin or place them in storage awaiting next call.

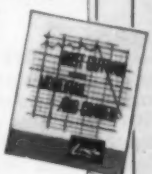
Louden Monorail Materials Handling Systems not only solve immediate handling requirements, but their flexibility enables future expansion and alterations to be easily accomplished. When you have plant requirements involving lifting and transporting loads, call on Louden for suggestions. Louden's unparalleled experience and proven engineering leadership combined with Louden's broad line of equipment can save time and mistakes. Write or wire today.

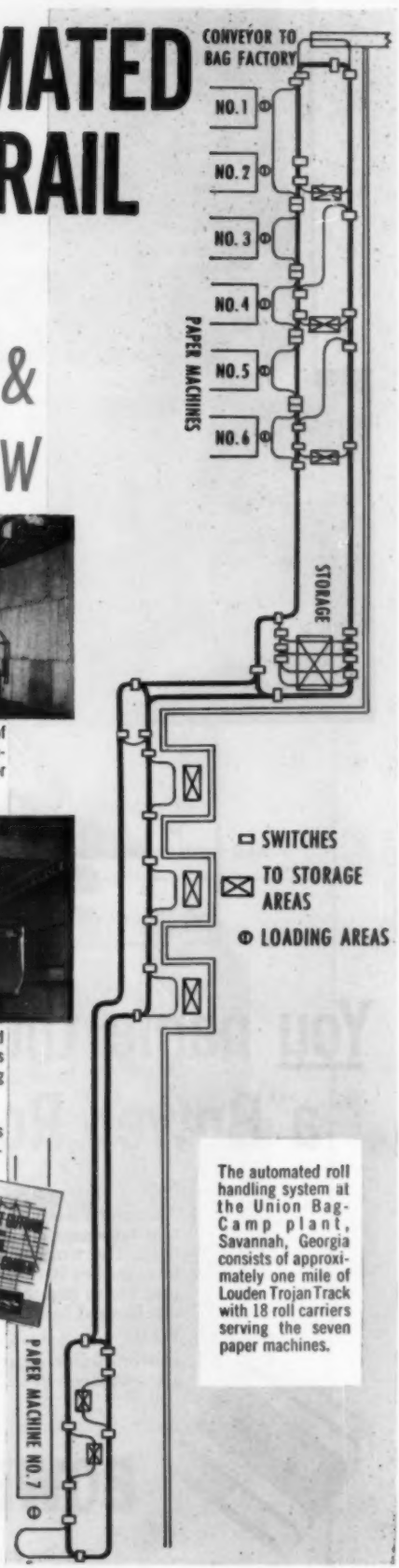
As one carrier delivers a roll of paper for storage, another automatically stops and waits for station to clear.



Completely unattended, loaded carrier travels to destination as empty carrier returns to a loading siding requiring a carrier.

SEND for your copy . . . 52 pages of illustrated applications, industry by industry. Get the latest, most complete information on planning and equipment selection for the best in materials handling. Write today for "COST-CUTTING WITH MONORAIL AND CRANES."



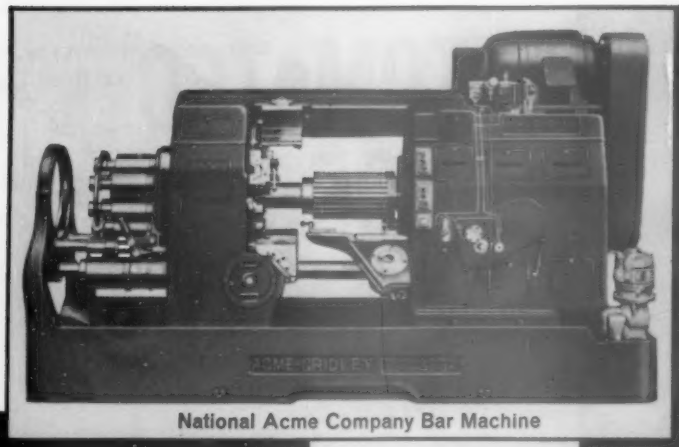


The automated roll handling system at the Union Bag-Camp plant, Savannah, Georgia consists of approximately one mile of Louden Trojan Track with 18 roll carriers serving the seven paper machines.

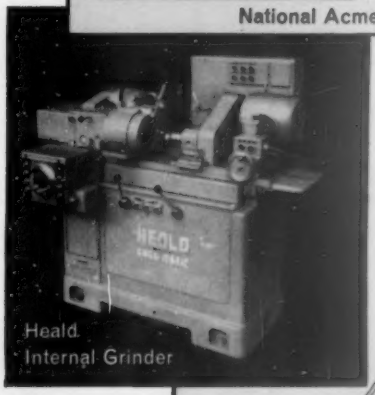
Louden MONORAIL & CRANES

THE LOUDEN MACHINERY COMPANY
915 Broadway, Fairfield, Iowa
A Subsidiary of Mechanical Handling Systems Inc.
Plants in Fairfield, Iowa and Clark, New Jersey

SINCE 1867...THE FIRST NAME IN MATERIALS HANDLING

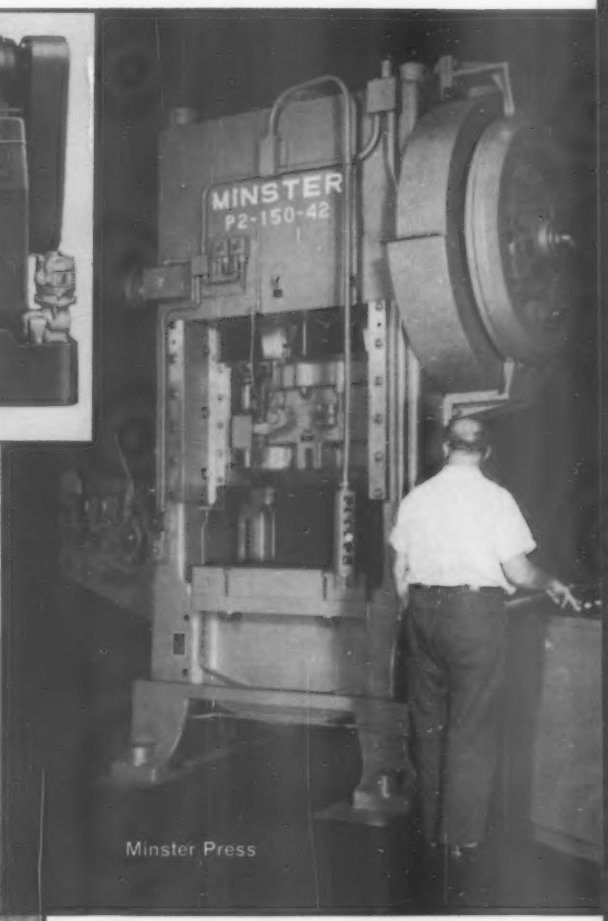


National Acme Company Bar Machine



Heald
Internal Grinder

Bucyrus-Erie Heavy-Duty Crane



Minster Press

You name the machine...there's a Bower Roller Bearing to fit it

All these machines use Bower Roller Bearings as original equipment. There are many more. But, no matter what kind of machine it is—no matter who makes it—one thing is certain: The close tolerances required by these machines have been established by precision Bower Roller Bearings. Why?

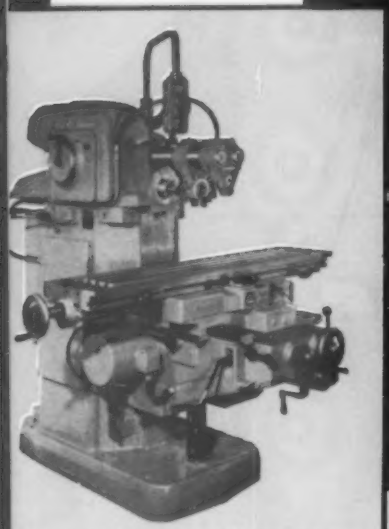
Bower Roller Bearings (straight and tapered) are engineered to hold running-friction to a minimum—even in heavy-duty or high-speed applications. Bower Roller Bearings have superfinish raceways to substantially reduce bearing maintenance. They last longer . . . they cost nothing extra!

Next time, be sure to specify "Bower" for your bearing replacement stocks. Your Bearing Specialist can give you rush service on every size and type. Call him today!

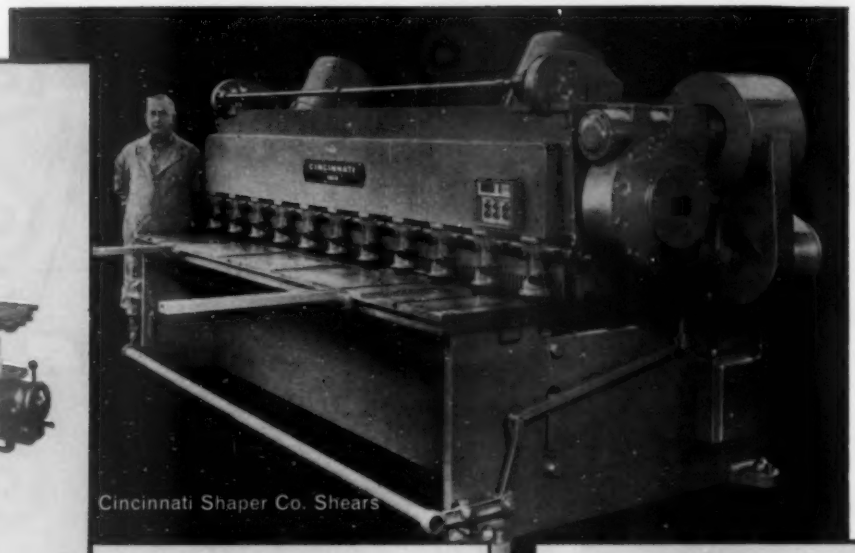
BOWER ROLLER BEARINGS

FEDERAL-MOGUL SERVICE
DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC. • DETROIT 13, MICHIGAN

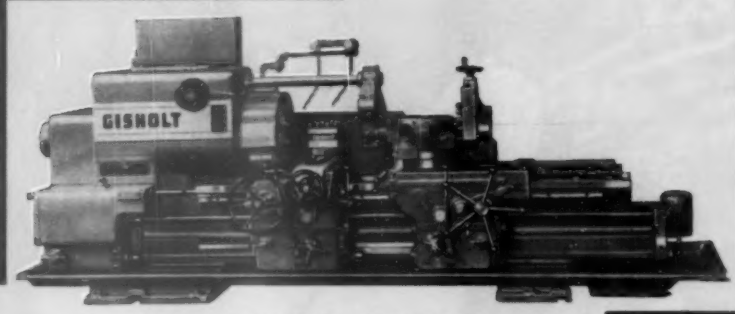
BEARING BOWER ROLLER BEARINGS SERVICE
FACTORY



Brown & Sharpe "Rangemaster"®

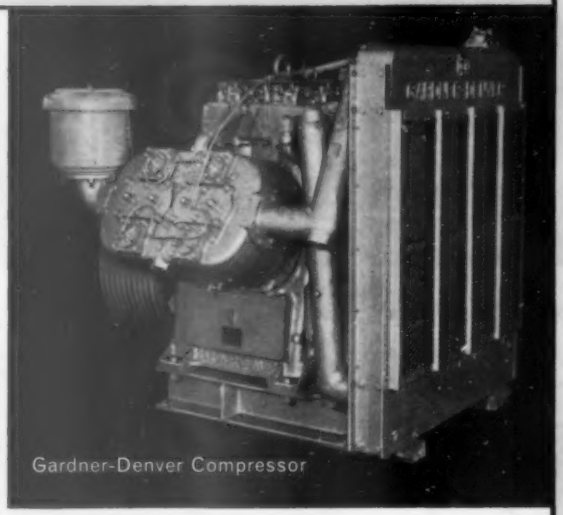


Cincinnati Shaper Co. Shears

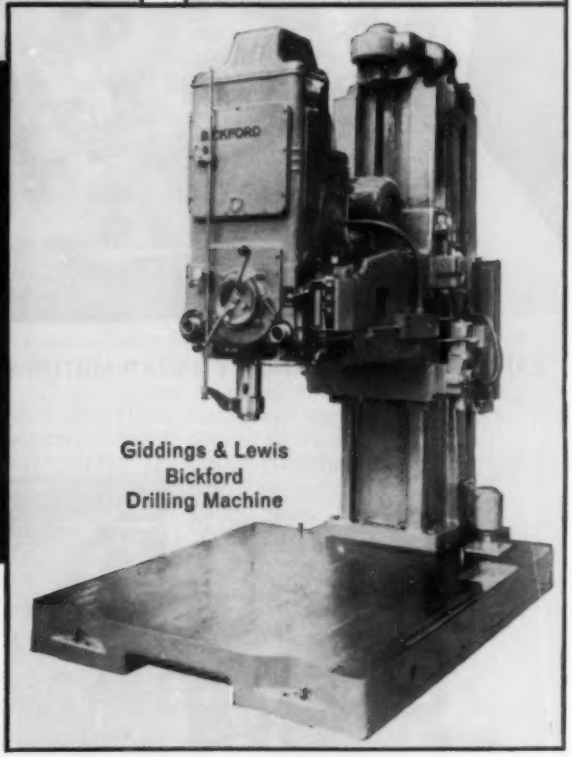


Gisholt Masterline Saddle Type Lathe

DoALL Zephyr Band Saw



Gardner-Denver Compressor



Giddings & Lewis
Bickford
Drilling Machine

CUTLER-HAMMER QUALITY 3-STAR MOTOR STARTERS AVAILABLE IN 10 SIZES, 00 THROUGH 8

CUTLER-HAMMER MOTOR STARTERS

Still the proven standard of quality...always in stock for immediate delivery

Millions of satisfactory operations in thousands of applications have proved the unmatched quality of Cutler-Hammer across-the-line magnetic starters. That this line is still recognized as the leader—nine years after the original design was developed—is a great tribute to the years-ahead thinking of Cutler-Hammer engineers.

FIRST IN '53—STILL THE LEADER IN '61

Since the Three Star line was introduced in 1953, many improvements have been made; magnet coils that far exceed NEMA standards, for example. But many achievements of the original design—vertical, dust-free contacts; overload relays adjustable to within 3% of actual full-motor ratings; provision for 2 or 3-coil overload relays in the same enclosure—are features no other manufacturer has been able to improve. You can safely bet that when these pace-setting features are improved, it'll be another Cutler-Hammer development.

ALWAYS AVAILABLE FOR FAST DELIVERY

You'll find the smaller sizes of Cutler-Hammer Starters always in stock at your local distributors—larger sizes immediately available from the factory. We hope you'll make your own feature-by-feature comparison between the Cutler-Hammer line and any other starter on the market. Look especially carefully at such vital advantages as ease of installation, high interrupting capacity, coil construction and accessibility.

Regardless of what features you select as the criterion of superiority, we're sure you'll choose Cutler-Hammer after you've made your unbiased comparison.

If you're one of many companies being forced to stock two sets of parts because of design changes, now is an excellent time to standardize on Cutler-Hammer.

Call your distributor or local Cutler-Hammer Sales Office soon. Or write for Publication LO-70-S211.

WHAT'S NEW? ASK..

CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wisconsin • Division: Airborne Instruments Laboratory • Subsidiary: Cutler-Hammer International, C. A. • Associates: Cutler-Hammer Canada, Ltd.; Cutler-Hammer Mexicana, S. A.

For more facts Circle 448 on Reader Service Card

Here's one good reason for replacing with FAFNIR BALL BEARINGS

Fafnir's all-inclusive line of ball bearing units speaks for itself of Fafnir's wide experience with power transmission requirements. You can also count on Fafnir for "firsts" that give you *more* for your bearing dollar. For example, Fafnir developed the first ball bearing "economy package" . . . the first self-locking bearing collar . . . the first successful contact and slinger-type integral seals. Whatever your power transmission needs, it *pays* to look to Fafnir.

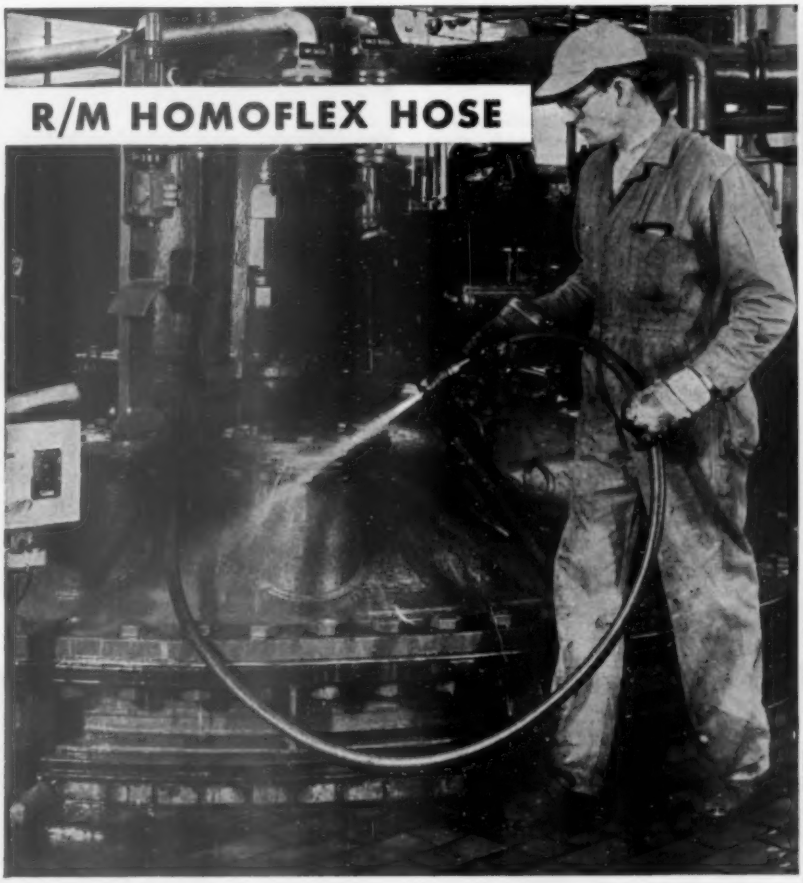
. . . and here's another — your Authorized Fafnir Distributor

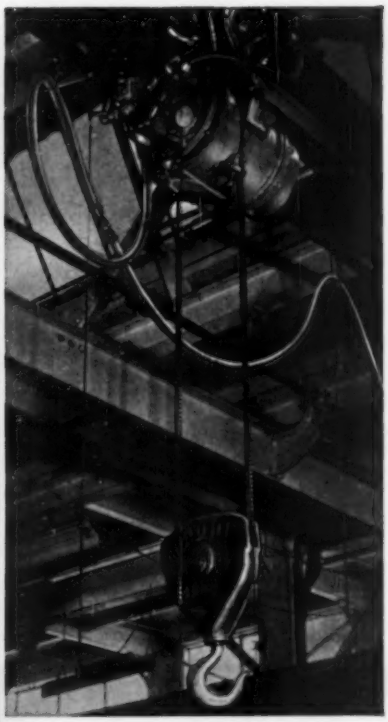
Your Authorized Fafnir Distributor has everything you need in ball bearings . . . all types, all sizes, for all purposes. And he's ready to help — day or night — when you need bearings in a hurry!

For job-perfect replacements . . . for top-flight service . . . for sound advice on bearing problems, call your Authorized Fafnir Distributor. Like you . . . he is paying his share of U. S. taxes. The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR BALL BEARINGS

For more facts Circle 449 on Reader Service Card





HOMOFLEX Means Hose That Is "Flexible As A Rope" ...Light, Yet Strong

Homoflex is the easiest handling hose made for use with air, water, other fluids and gases. Weighs less than any hose for equal pressure.

- **Super-Strong**—assures longer, trouble-free service life
- **Precision Built**—with super-strength low-stretch cords
- **Mandrel-Made**—no pre-set twist
- **Kinkless**—coils and uncoils freely in any direction
- **Homogeneous Construction**—provides inseparable tube-to-cover bond
- **Safer, Easier To Couple**—inside and outside diameters are uniform

Homoflex Hose provides savings in labor and costs wherever you use it around the plant. Let your R/M distributor show you the advantages of Homoflex . . . and other R/M hose constructions that give you "More Use per Dollar." Write for Catalog M5.

EXCLUSIVE HOMOFLEX CONSTRUCTION makes strength member and tube virtually inseparable for long, trouble-free service. Uniform inside and outside diameters permit faster, safer, easier coupling—faster, fuller flow.

RM110

RAYBESTOS-MANHATTAN, INC.
MANHATTAN RUBBER DIVISION • PASSAIC, N. J.
ENGINEERED RUBBER PRODUCTS

NEW "DIAL TORK" Nutrunner. The only power tool you can "dial in" for the precise torque you want. Ideal for the type of assembly or service work where a variety of fasteners must be tightened to different torque settings—with hand torque accuracy.

"One-Shot" Air Screwdrivers with offset or lever handles; reversible or non-reversible; silent exhausts. Torque range: 7 to 100 in.-lbs.

✻ The secret of CP "One-Shot" Fastener Driving Tools lies in the precise torque sensing ability of the tools themselves. Put the tool on the work—press the throttle—the instant precise torque is attained *all* driving action stops. Its torque-awareness is unequalled by *any* clutch for *accuracy* and *consistency*. So don't just specify "torque control"... be *sure* you specify CP "One-Shot."

CP "One-Shot" Screwdrivers can save up to 75% in fastener driving time... eliminate stripped threads.

Chicago Pneumatic

PNEUMATIC TOOLS • ELECTRIC TOOLS • AIR COMPRESSORS • DIESEL ENGINES • HYDRAULIC TOOLS • AVIATION ACCESSORIES

FACTORY

"One-Shot" Electric Screwdrivers with lever or offset handles. Torque range: 7 to 100 in.-lbs.

"One-Shot" Angle Nutrunners are jolt-free... easy to hold! Fasteners installed accurately to torque specifications. Range: ½ to 200 ft.-lbs.

CP-200 Torque Analyzer provides fast, simple method for checking clutch settings and stall torques of portable tools. Maximum capacity: 200 in.-lbs.

If your responsibility is threaded fastener driving...

DON'T JUST SPECIFY "TORQUE CONTROL" ...SPECIFY CP "ONE-SHOT"* FOR THE ULTIMATE IN TORQUE ACCURACY, CONSISTENCY!

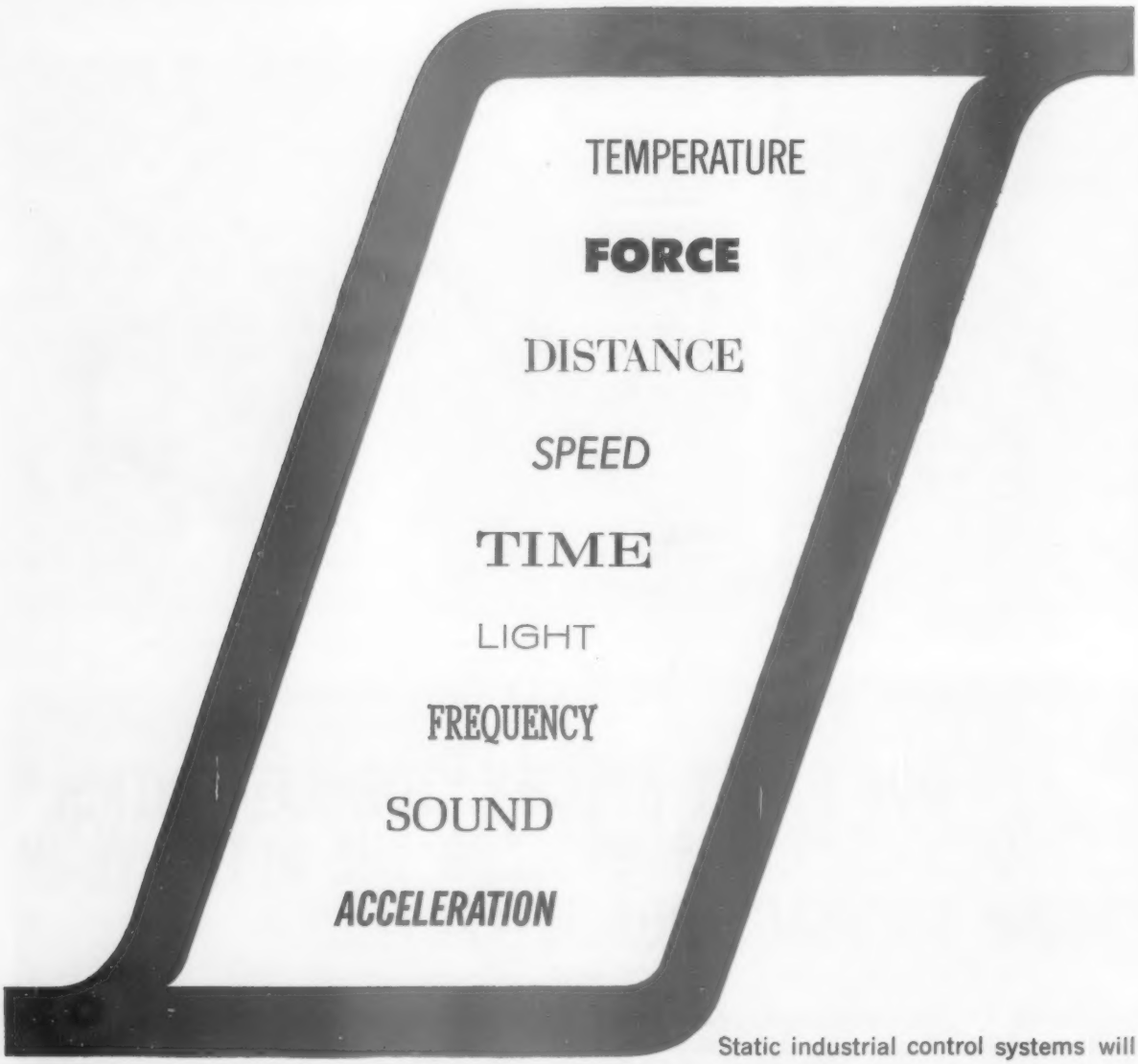
Since the first CP "One-Shot" torque control power screwdriver was introduced in 1954, industry has come to realize the *real plus values* of the consistent accuracy these tools maintain. They have proved their money-saving advantages because:

1. They cut spoilage and rejects to a minimum.
2. "One-shot" principle reduces clutch wear to the minimum... torque settings remain constant indefinitely... but are readily adjustable over a wide range when job specifications demand it.
3. They make training of operators easier and faster... simplify changes in work assignments.

CP manufactures the most extensive line of "one-shot" tools available today. Let a CP Torque Control Specialist help you solve your fastener driving problems. *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N.Y.*

"One-Shot" Nutrunners hold their settings... simplify training of operators.

For more facts Circle 451 on Reader Service Card



Static industrial control systems will regulate virtually anything that is controllable – and under normal operation these *magnetic* systems will never break down, wear out or need servicing. Temperature (with precision to ±1/4°F at 2200°), position (with logic involving *and, or, not, memory* and *time delay*), speed, force, light, sound, acceleration, frequency, distance, field strength and pressure are but a few. ■ One manufacturer has replaced a vacuum tube-mechanical relay system on his high-speed assembly lines. Reason: it broke down every three weeks. The replacement magnetic static control system has now gone through 26,000,000 consecutive cycles without fault. ■ The symbol above, the magnetic hysteresis loop, , may encompass some of your control problems which are solvable at a lower overall cost. May we discuss this with you? Magnetics Inc., Department F-93, Butler, Pennsylvania.

INDUSTRIAL CONTROL EQUIPMENT

MAGNETICS inc.®

For more facts Circle 452 on Reader Service Card

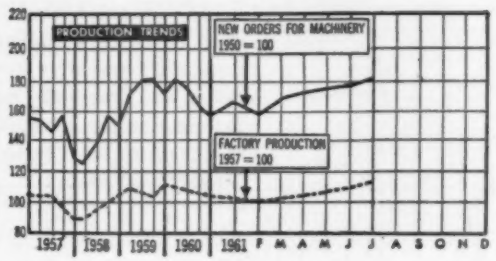
LOOKING AHEAD IN BUSINESS

A FACTORY PRESS TIME REPORT

FACTORY FIGURES OF THE MONTH

Indicator	JULY[p] 1961	JUNE[r] 1961	JULY 1960
New Orders for Machinery (exc. elec.)[1]	181.0	179.0	179.0
Contracts for Industrial Construction[2]	110.0	111.0	151.0
Factory Production[3]	113.0	110.0	110.0
Consumers' Prices (cost of living)[4]	128.1	127.6	126.6
Industrial Prices (materials, supplies)[4]	127.4	127.4	128.2
Manufacturing Employment (millions)[5]	15.9	16.0	16.3
Total Employment (millions)[5]	53.2	53.1	52.9
Unemployment (millions)[5]	5.1	5.6	4.0

p = preliminary r = revised



Sources: 1. McGraw-Hill Dept. of Economics (1950 = 100); 2. Engineering News-Record (1950 = 100); 3. U. S. Federal Reserve Board (1957 = 100); 4. U. S. Dept. of Labor, Bureau of Labor Statistics (1947-49 = 100); 5. U. S. Dept. of Labor, Bureau of Labor Statistics.

Recovery quickens as defense grows

THE OUTLOOK

Though the recovery was consumer-generated, defense spending will keep it going. If inflation threatens, big government will take immediate action. Unemployment and war talk still worry planners.

American business goes up more easily than it goes down. Within *five* months after February's recession low, industrial production has reached peak levels again. The same kind of climb took 10 months after the 1958 recession; 12 months after that of 1954. Recovery is strongest in consumer goods and utilities. The lag in durables promises to be made up this fall. Reason: New orders for durables are already at a two-year high. Total industrial production may exceed 1960's—perhaps by 2%. This strong push could raise the growth in 1962's output above the 10% previously forecast.

The translation of higher defense and foreign-aid allocations into hard goods production, will support many months of good business. Increases in military spending are already showing up in production figures. The 10-year plan to spend $20-billion in Latin America will generate new orders gradually. The result will be new markets south of the border. But neither military nor investment spending abroad will have a big effect immediately. When it does come later, it will act to keep the present lift from sagging.

Fortunately, this year's recovery has not yet brought higher prices. Commodity prices are just beginning to budge from their three-year stability. Home buyers are responding to reasonable interest rates. Expectations for installment buying are getting brighter. It seems likely that businessmen can look forward to borrowing at close to present rates of interest for a few months.

So long as there are no signs of inflation, government remains relatively aloof. But if prices start to rise, it will be a signal to make borrowing more expensive. Then government-spending programs on the home front will be stretched out. Higher taxes may be necessary if the boom starts to get out of hand. However, inflation won't come before factories are running at full capacity.

Unemployment still remains a serious consideration. The 6.9% jobless rate recorded recently would have been higher if government and service employment rises had not offset cutbacks in manufacturing and utilities. The rate is dropping. But government projects are gaining favor as outlets for men put out of work by technological change.

The speed-up of the economy is accompanied by a faster-than-anticipated shift to inventory accumulation. Capital spending by industry will follow. From a currently healthy level of $35-billion, it could rise to $45-billion a year from now. If this is the case, the gross national product, now about $525-billion, would average as much as $565-billion for 1962.

The danger of war can't be forgotten. It is bound to take the enjoyment out of prosperity. With one eye on the headlines, businessmen and government officials are ready to change their plans if need be. A sudden shift in international winds cannot be discounted in making business plans.

WASHINGTON WIRE

A FACTORY PRESS TIME REPORT

Amid confusion over Berlin, Administration advisers agreed to table President Kennedy's controversial tax credit plan. The plan would have given plant men an 8% credit on new equipment purchases. On the word of Treasury Secretary Dillon and Democratic members of the House Ways and Means Committee, the whole tax question was put off until January. Then the President plans a tax reform message to Congress. What form it will take is anybody's guess. Everything depends on the international scene.

After his House Ways and Means Committee tabled Mr. Kennedy's tax proposals until next year, Chairman Wilbur D. Mills (D-Ark.) released this statement: "The heart of the President's program was . . . tax credit . . . for modernization. This legislation will be perfected during the fall months and will be the first order of business in the next session of Congress." Though encouraging on the surface, the words were a definite source of personal disappointment to the President.

Check this list of legislation passed by the 87th Congress—some of it could affect your operations: Minimum wage raised to $1.25 an hour in two steps, with coverage extended to 3.6-million workers; a $394-million loan-grant program to help depressed areas attract industry; Social Security retirement age reduced to 62 for men but at lower benefits; federal grants for water pollution doubled; defense budget increased $6.2-billion over last year to $46.7-billion.

Defense Secretary McNamara is ready to create a "defense supply agency" to centralize management of military procurement. He envisions a sweeping reorganization under which the new agency would take over purchasing and supply management tasks now handled by eight so-called "single managers." Each of the single managers is responsible for a specified class of common-use items. The new agency would be responsible directly to the Secretary of Defense. It would be supervised by a defense supply council made up of representatives of all the services.

The proposed reorganization is likely to stir a political fuss. Reason: It would reduce the operations of several tradition-encrusted military agencies that have friends in Congress. Military suppliers—particularly smaller ones—may also take a dim view of the move. Critics fear it would lead to fewer sources of supply, with the new agency buying in larger lots from fewer and fewer contractors. Can it be stopped? Only if the Secretary changes his mind. He has authority to set up the new agency, under the Defense Reorganization Act of 1958—without Congressional approval.

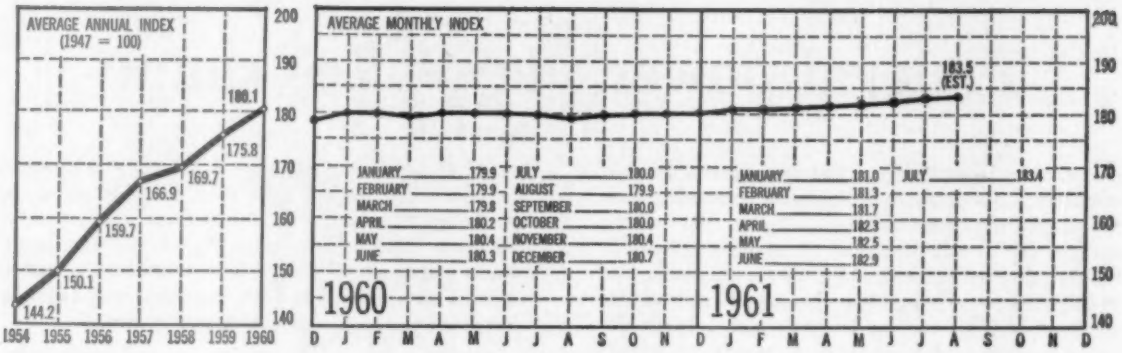
State-regulated safety control of industrial uses of atomic materials finally is on its way after many delays. Kentucky will be the first state to assume such control—probably in another month or so after final details are ironed out. This means that the state, rather than the Atomic Energy Commission, will have regulatory control over industrial uses of radioisotopes; nuclear source materials such as uranium and thorium; special nuclear materials such as U-233, U-235, and plutonium; and other atomic materials in less than a critical mass.

Literally thousands of companies across the country are licensed to use these nuclear materials for scores of industrial purposes. The Kentucky move will pave the way for other states to assume regulatory control. Eleven have enabling legislation—N.Y., Miss., Tex., Calif., Tenn., Wash., Ore., Fla., Ind., Idaho, and Ill.

With defense manpower calls being increased drastically, here's what you should know about the re-employment rights of your employees: The Selective Service Act requires you to rehire a draftee, enlistee, reservist, or National Guardsman called to active duty—if he applies for his old job within 90 days after his discharge from the service. The rehired man cannot be fired—except for just cause, of course—for one year. But if a serviceman extends his tour of duty beyond four years, he waives his re-employment rights. The law is vague as to the new serviceman's civilian debts. In essence, he is required to pay debts only to the extent of his financial abilities. Courts determine this if a creditor takes legal action.

COST INDEX OF PLANT MAINTENANCE

A FACTORY PRESS TIME REPORT



Prices continue slow pace upward

	AVERAGE 1960	JULY (Preliminary)	JUNE (Revised)
Building and Facilities Index	170.6	174.7	174.4
Materials	140.1	138.9	138.7
Brick	154.9	155.2	155.2
Elec. fixtures	131.9	130.9	130.9
Elec. switches, boards, fuses	183.3	183.0	182.0
Elec. wire, copper	147.0	142.4	142.4
Glass	148.1	147.7	147.7
Gutters, spouts, ducts	180.3	180.4	180.4
Gypsum products	140.9	142.4	142.4
Heating equipment	125.5	121.1	121.1
Lumber	128.7	123.6	123.8
Millwork	156.7	151.8	153.5
Paint	130.2	134.3	134.3
Pipe, cast iron	170.4	170.4	170.4
Pipe, steel	190.7	188.7	188.7
Pipe & tubing, copper	151.5	116.9	116.9
Roofing	113.9	121.4	120.0
Sanitary fixtures	162.4	161.8	161.8
Sash, metal frame trim	137.4	137.0	137.7
Solder	122.5	136.9	133.6
Steel, structural	236.3	236.3	236.3
Tanks, steel	139.6	136.7	136.7
Valves & fittings	167.8	163.3	163.7
Wire mesh	163.8	156.7	159.2
Labor	191.0	198.6	198.2
Carpenters	177.3	185.5	184.1
Electricians	199.4	206.8	206.8
Painters	196.2	203.6	203.6
Equipment Index	184.2	187.1	186.5
Materials	177.6	178.1	178.2
Abrasives	157.9	157.3	157.3
Alloys, non-ferrous	123.2	135.7	133.0
Bars & plate, steel	227.2	227.2	227.2
Bearings	160.0	155.4	155.4
Belting	160.9	163.2	166.9
Bolts, nuts & screws	225.2	236.2	236.2
Chain	187.4	193.8	193.8
Controls (electrical)	183.3	183.0	182.0
Gear-reduction units	181.1	174.5	174.5
Hand tools, mechanics	204.5	208.3	208.3
Lubricants	125.7	125.7	125.7
Motors	145.0	137.0	137.9
Non-ferrous metals	135.8	129.2	129.2
Precision tools	158.2	166.2	163.5
Pumps	235.4	197.0	197.0
Tools, cutting	186.8	182.1	183.1
Valves & fittings	167.8	163.3	163.7
Labor	188.7	193.1	192.0
All mfg. labor	185.1	189.2	188.4
Machine tool labor	192.1	196.3	195.6
FACTORY'S COST INDEX	**180.1**	**183.4**	**182.9**

For the seventh consecutive month, FACTORY's Cost Index of Plant Maintenance in July crept up again. The 0.5 increase resulted from slightly higher materials prices and moderately higher labor costs. Here's a recap of prices:

In the equipment component, materials were down 0.1. The drop was paced by belting and cutting tool prices, off 3.7 and 1.0 respectively. Electric motors registered 0.9 decline. Valves and fittings were off 0.4. On the plus side were non-ferrous alloys, up 2.7, and electrical controls, 1.0.

In the building and facilities component, labor costs edged up 0.4. Materials costs were 0.2 higher. Electrical controls prices were up 1.0; roofing, 1.4; solder, 3.3. Price declines were small, except for valves and fittings which fell 2.5.

The length of the average factory work week grew slightly longer in July as production increased. This boosted the combined cost of manufacturing labor and machine tool labor 1.1.

Even if the Berlin crises gets no worse, there will certainly be a rising level of defense spending in the months ahead. Thus, the federal budget will be heavily in the red. Without the additional defense outlays the deficit would have been $5.0-billion. Most experts now see a $6.5-billion deficit for the current fiscal year.

The prospective deficit is, of course, one of the main reasons for fearing an outbreak of inflation again after 18 months of generally declining industrial prices. However, with industrial capacity still adequate and unemployment far from licked, no sharp upsurge of prices seems likely. Industrial prices will probably show only a moderate upward drift through the rest of 1961 and on into the early months of next year.

But if the federal deficit is as large as expected, it will be the second biggest in the last 15 years. This will probably accelerate the rise of prices by the autumn of next year.

LOOKING AHEAD IN LABOR

A FACTORY PRESS TIME REPORT

Federal power play takes shape

After nine months in office the Kennedy Administration's labor-management planning has developed clear-cut outlines. To say the coming changes are drastic is almost an understatement. If fulfilled, they will substantially alter our current system of collective bargaining. Management hiring and employment policies will be affected—not only in the make-up of the work force but in the wage rates as well. The changes will be felt first in the major industries and in transportation. But in time they will filter through our entire labor relations system.

In a nutshell, the government intends to jump into labor-management affairs with both feet. Past federal intervention will seem mild in comparison. But—and this is important—the action of the White House and the Labor Secretary will be in the form of pressures. The Administration will not issue orders on what it wants done. Instead it will set guidelines and then exert firm pressures to see they are followed through.

To be specific. The Administration intends to prevent major strikes—not just the national emergency kind, but all walkouts that would encompass an entire industry. The auto negotiations fit this formula, although they came along too soon for the completed policy to apply.

The White House is leading up to tripartite panels, in specific industries, which would be responsible for labor peace. Tripartite boards are not new in labor disputes. But in the past they aimed at merely speedy settlements, regardless of cost. The boards' "public members" or administration representatives, have gone along with the wishes of labor and management. But now they are concerned with actual settlement terms. They'll strive to keep them within bounds; to avoid economic surges that would result in new inflationary spirals or further damage to our competitive foreign trade. Though not heralded as such, the White House Labor-Management Advisory Committee is the first step in this direction.

The Administration's anti-discrimination program is another firm government move. The President's Committee on Equal Employment Opportunity is promoting "plans for progress" within industries with major government contracts. These companies are urged to review their personnel policies and agree to introduce Negroes into their work force—at all levels. By the end of 1961, the committee expects to have some 50 major defense contractors signed up. The agreements will show that signers have voluntarily agreed to end job bias, not only in work on government contracts, but through their entire industrial system.

Automation and "hard core" unemployment is the target of the Kennedy team's third thrust. With 1-million workers jobless for at least half a year, and with little prospect for securing work for these men, the Administration is plugging, with apparent success, a bill that would permit retraining of the jobless—at government expense. The first legislation would run for two years only. It would affect less than 100,000 workers. But this is just a first step. If it works, retraining would be promoted across-the-nation and industry-wide.

Top officials in and outside government, already warn that federal intervention in these areas is on the way. Some of the comments:

W. Willard Wirtz, Under Secretary of Labor: "The strike and the lockout, like the force of arms in international relations, may continue to be regarded as effective in comparatively small, limited disputes. But the big strike, the big lockout, covering a whole, vital industry may well be moving into much the same position as the atom bomb."

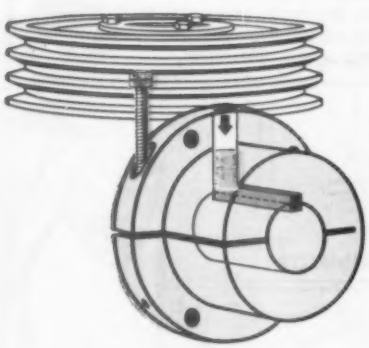
Archibald Cox, Solicitor General: "There will be much greater government activity, not only in the fields heretofore occupied by collective bargaining, but also in the areas of employment and industrial relations now of dominant concern to industrial workers. All the underlying forces now at work point in this direction."

Joseph Beirne, president of the Communications Workers: "If predictions made in Washington are accurate, President Kennedy's aides are preparing to move into the field of collective bargaining in a way that will make everything up to now seem mild."

This is the route of the Kennedy Administration. It will be a slow, step-by-step process. But all the steps lead in a single direction.

SEE LABOR RELATIONS NEWS, PAGE 200

"AND THEN THE KEY CAME LOOSE..."



"Well, the key broke a window—it could have killed someone. A shaft was scored . . . the loss of drive power resulted in a loss of material . . . over $1,000 . . . we had to postpone deliveries 4 days." Frankly, this plant manager had it rough . . . though it could have been a lot worse, too. But he could have avoided the trouble completely by using Worthington sheaves that have the Two Golden Screws.

The Golden Clamp Screw at the left is an exclusive Worthington feature that locates and locks the hub securely on the shaft, permitting you to tighten the set screw without distorting the hub. And note that the two-piece hub-and-rim design simplifies installation. You install one piece at a time—or change sheaves without disturbing the hub or affecting the alignment.

The Golden Screw on the right is the set screw that turns down to lock the key securely in place. It prevents potentially damaging key drift. There's no extra cost for the set screw but it is worth its weight in gold for the safety it provides.

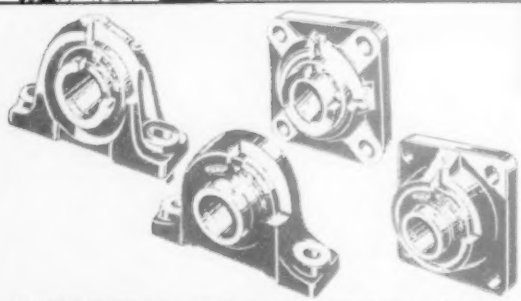
These Worthington hubs are standard in three major Worthington drive systems: the new, money-saving, more compact Multi-Wedge Drive; the standard Multi-V Drive and the Positive Drive. Ask for one or more of the "how-to-figure-it" design manuals shown here. Your local Worthington distributor stocks these products. He's listed in the Yellow Pages. Or write Worthington Corporation, Section 79-42, Oil City, Pennsylvania.

WORTHINGTON

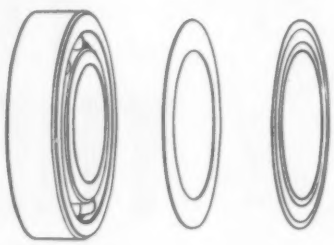
PRODUCTS THAT WORK FOR YOUR PROFIT.

For more facts Circle 453 on Reader Service Card

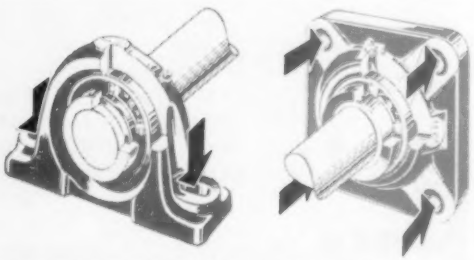
DISTRIBUTOR DAN, the SKF bearing man, shows how SKF PILLOW BLOCKS AND FLANGED MOUNTINGS eliminate 5 pesky maintenance problems



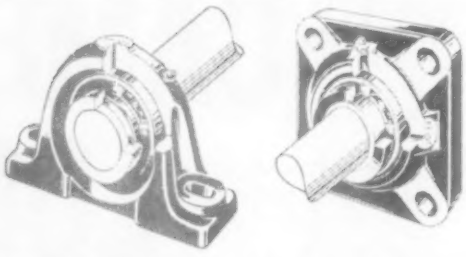
NO MORE FOOLING WITH FITS because SKF makes 27 sizes of unit pillow blocks for shafts ranging from ¾" to 4" dia.—and flanged mountings for 24 shaft sizes from ¾" to 2 15/16" dia. Most sizes are available with set screw or eccentric locking collars.



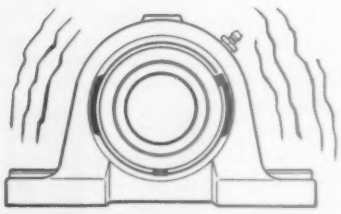
SOLVES SEALING PROBLEMS. Both units are prelubricated and equipped with seals that really seal. The red washer is made of tough, durable DuPont "Fairprene"—backed by a sturdy metal plate. Rotating flinger actually flings dirt away from the bearing.



EASILY INTERCHANGEABLE. You can quickly substitute SKF units for other worn-out or damaged mountings. Bolthole spacing and center heights are designed so that the units can be interchanged with other mountings of similar design.

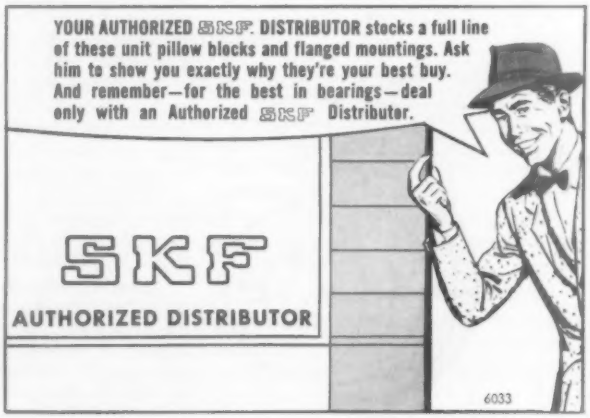


MOUNTING MADE EASY. You can install these pillow blocks and flanged mountings in minutes! Because, the spherical outer ring provides easy initial alignment—compensates for misalignment. Separate locking collar and set screws ensure fast adjustment.



RARELY NEED REPLACING. SKF Unit Pillow Blocks and Flanged Mountings are competitively priced. Yet their cast one-piece housings last longer—withstand all types of shock and abuse. Units rarely need relubrication or replacing.

YOUR AUTHORIZED SKF DISTRIBUTOR stocks a full line of these unit pillow blocks and flanged mountings. Ask him to show you exactly why they're your best buy. And remember—for the best in bearings—deal only with an Authorized SKF Distributor.



SKF MOTION ENGINEERING

Advanced ball and roller bearing technology

For more facts Circle 454 on Reader Service Card

THE AUTOMATION & UNEMPLOYMENT PROBLEM

HOW BIG IS IT?

only 2% of the manufacturing workforce will be displaced by "automation" in 1962

According to a brand-new survey conducted by FACTORY, that's the size of the automation-unemployment problem facing manufacturing industry today. It's not quite so large as many people thought.

FACTORY's survey of over 500 plants shows that about 325,000 men and women in manufacturing plants will have their jobs bumped out from under them by labor-saving installations next year. This group includes (1) those who are reassigned to or retrained for other work in their own companies; (2) those who lose their jobs and must be retrained for other work elsewhere.

The survey seems to show that the intensity of industrial automation is relatively weak. For instance:

. . . 47% of all plants say they will displace none of their employees in 1962.

. . . 24% say they will displace less than 1%.

. . . 24% say they will displace from 1 to 5%.

. . . Only 5% say they will displace more than 5%.

When an average is struck, this activity affects only 2% of the 16-million men and women in manufacturing.

For a summary of reader reactions to proposals for increasing manufacturing employment, turn the page.

AUTOMATION & UNEMPLOYMENT

Plant management vetoes bureaucratic solutions

Government tampering with wages or prices will not help create more jobs in manufacturing plants. That's the verdict of 546 plant management men who responded to the "unemployment" ballot in the July issue of FACTORY.

Management cast a doubting eye at protective tariffs, too. On the other hand, it looks with favor on tax incentives to reward companies that stabilize employment. And it sees some merit in more government spending for public works and for defense. Opinion as to the value of a shortened work week in relieving unemployment appears to be divided.

While plant men would veto the idea of government participation in solving unemployment in manufacturing, they do not accept much of the responsibility for themselves. Instead, they shift it over to the marketing side of their organizations. Survey respondents were overwhelmingly sanguine about the good effect of adding more products to the company's line and of a harder effort on the part of the sales group.

Of measures well within the grasp of plant management, only an effort toward greater leveling of year-round production shows much promise, they said. Reduction of subcontracted-out work would contribute relatively little. Postponement of methods improvements is viewed as ineffectual, if not downright foolhardy.

Specifically, here's how managers of plant operations judged the value of 12 proposals to create more employment in manufacturing plants:

. . . *Institute government-regulated price controls:* 87% say this would be of no value. Strongly negative reactions to this and the following suggestion demonstrate management's militant attitude toward government's interference in business affairs. "A bad idea," says a vice president of production in a small food plant. "Would probably decrease jobs," says a services superintendent in a medium-sized chemical plant.

. . . *Institute government-regulated wage controls:* 82% say "no." Minor difference in value between this and previous suggestion might indicate management's desire to deal freely with labor as well as with its customers.

. . . *Postpone methods improvement projects:* 67% say it would not create jobs. At best, respondents said postponement would bring only temporary relief. Most were indignant at the idea. For instance, a methods engineer in a large consumer products plant in Cincinnati says, "Effect would be negative. Methods improvements yield lower unit costs, which in turn lead to either (1) reduced selling prices (thus increased sales and production) or (2) increased profits which can be re-invested as capital expenditures. Thus, postponement means fewer jobs."

. . . *Raise tariffs to protect industry from foreign competition:* 65% say it wouldn't help. Response reflects realistic attitude toward international economy. "No, no, no," pleaded a manager of an Ohio glass bulb plant. "We'll automate to compete," says another manager. But an industrial engineer in an Alabama garment shop says, "Our markets are being flooded with foreign products. Higher tariffs are the only answer."

. . . *Reduce amount of subcontracted-out work:* 64% say "no effect." Idea had more appeal in larger plants (which presumably contract out more work). But one chief IE caustically describes it as "Mr. Reuther's program."

. . . *Shorten the legal work week:* 49% say it would not help, 51% say it would provide "some" or "much" relief. Those who judge it might spread the work, feared for its long-term value. "Bad deal," says one plant manager.

. . . *Greater stress on leveling year-round production:* 60% think it would help. Why more do not feel this way is puzzling. In chemical, oil, and rubber plants, for instance, estimate of value is strongly negative. Readers may have drawn strong distinction between *stabilized* and *created* employment.

. . . *More government spending on defense and public works:* 62% see value in this. As reluctant as respondents are to encourage bureaucratic interference, two-thirds feel that federal pump-priming would bring more jobs. One plant superintendent, however, brands it a "cost-of-living riser."

. . . *Tax incentives to reward job stabilization:* 69% rate this as beneficial. Enthusiasm is far from wild, however. "Who will pay for this subsidy?" asks a staff engineer in an automotive parts plant.

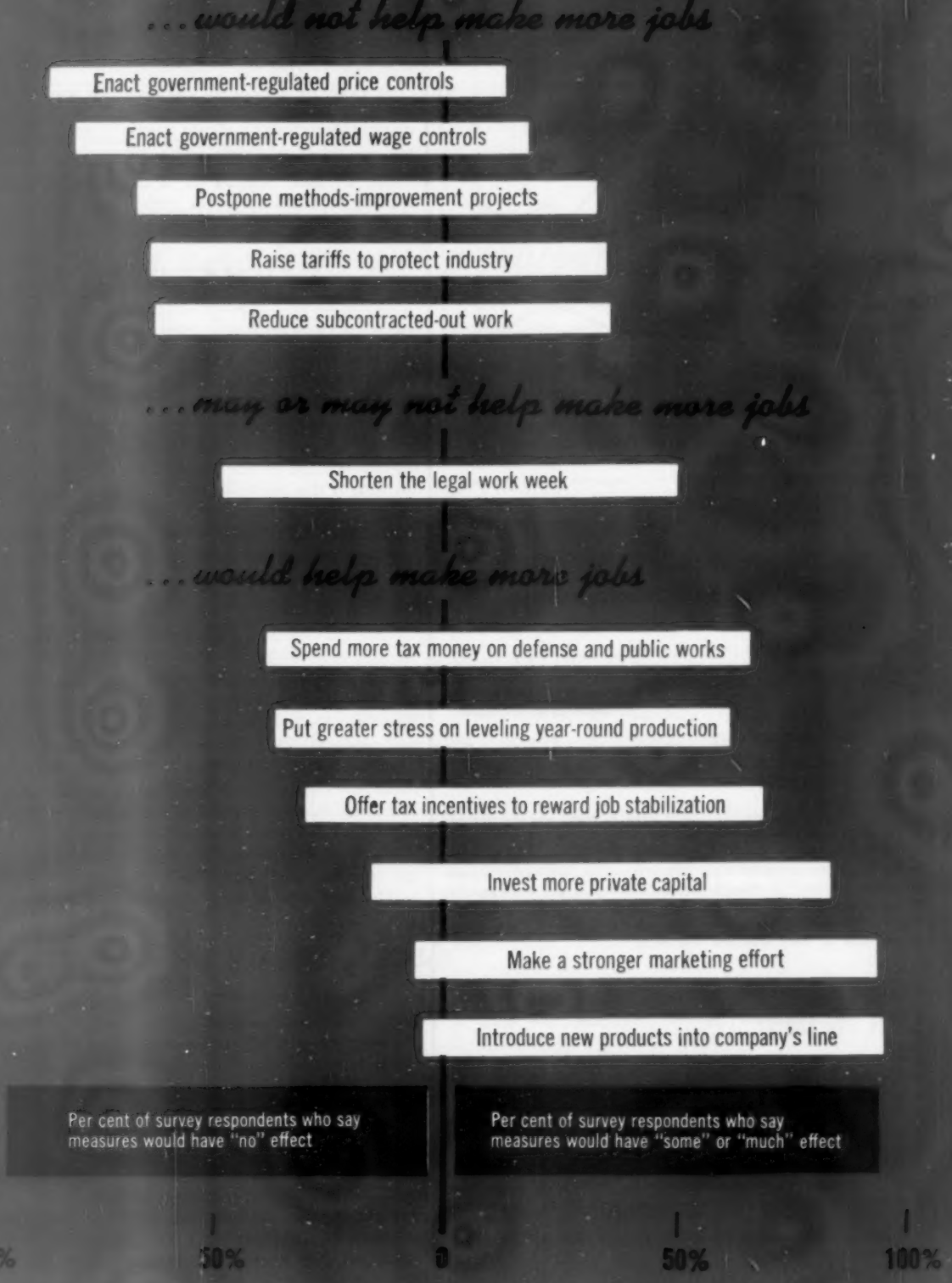
. . . *More capital spending by private industry:* 84% prefer this solution. Few quarrel with its value. But many feel depreciation laws discourage it.

. . . *Stronger marketing effort by sales department:* 91% judge this the touchstone of more jobs. Pity the poor sales organization: It's still tagged the scapegoat by plant management men and engineers.

. . . *Introduce new products into company's line:* 95% answer "some" or "much" value. From small plants to big ones, this suggestion was most popular. More things to make, more opportunities to sell in an uneven market, probably best reflects management's strong faith in free enterprise.

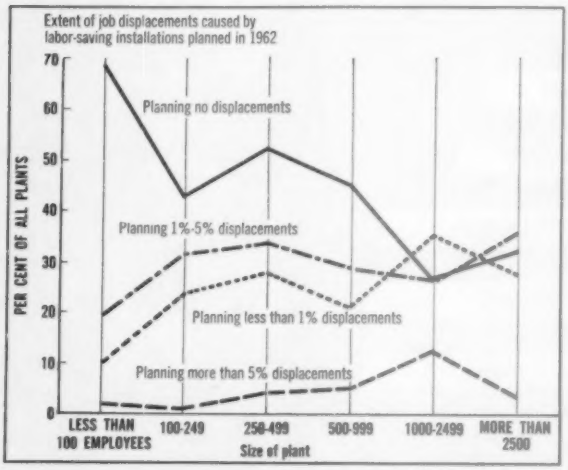
Turn the page

FACTORY readers say these measures...


...would not help make more jobs
Enact government-regulated price controls
Enact government-regulated wage controls
Postpone methods-improvement projects
Raise tariffs to protect industry
Reduce subcontracted-out work
...may or may not help make more jobs
Shorten the legal work week
...would help make more jobs
Spend more tax money on defense and public works
Put greater stress on leveling year-round production
Offer tax incentives to reward job stabilization
Invest more private capital
Make a stronger marketing effort
Introduce new products into company's line
Per cent of survey respondents who say measures would have "no" effect
Per cent of survey respondents who say measures would have "some" or "much" effect
100%
50%
0
50%
100%

HOW MUCH LABOR-SAVING ACTIVITY?

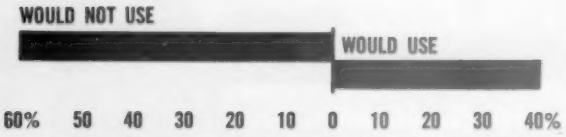
Respondents to FACTORY's survey estimate that workers displaced in any way by labor-saving installations total only 2%. The 2% figure is arrived at by multiplying [illegible] % of plants in each displacement category, adding the products and dividing by 100 (47% × 0 + 24% × 1 + 24% × 5 + 5% × 7 ÷ 100 = 2%).



As an index of productivity improvement activity, 2% is appallingly low. The fact that nearly half (47%) of all plants plan no such projects in 1962 is a commentary both on management lassitude and upon a tax climate that fails to provide incentive for increased capital investments.

WILL INDUSTRY BUY GOVERNMENT RETRAINING?

REACTION TO GOVERNMENT-FINANCED RETRAINING



"If government-financed retraining of technologically displaced workers were made available, would you use it?"

Six out of ten plants say they don't need or won't use government-financed retraining of displaced workers. Why this reluctance to make use of federal help? Listen: A vice president of a medium-sized bearings firm, "Would use—provided it was effective and not tarnished or slanted by union interests." A refinery engineer, "Many of our employees received training from the government while they were in military service. This training has been of little value even though it was similar to the type of work they are now doing."

ABOUT THE SURVEY

By publication deadline this survey drew 546 replies. Of this total, 86 work in plants employing less than 100 people, 114 in plants with 100-249, 85 with 250-499, 85 with 500-999, 85 with 1000-2499, and 91 in plants with 2500 or more.

Industrial and geographic distribution was in proportion to manufacturing employment. By title, 4% of respondents were company presidents; 7% VPs of manufacture; 35% works, plant, or production managers; 10% plant engineers; 9% chief IEs; 21% other engineering personnel, 5% industrial relations managers; and 9% in miscellaneous categories.

Validation of the sample showed it to have an unusually high degree of statistical reliability.

AUTOMATION & UNEMPLOYMENT

EDITORIAL

"Quit looking

These blunt words were written on a FACTORY survey form by a general mechanical foreman in a West Virginia steel plant. In one way or another a dozen other respondents said the same thing.

A study of the survey statistics will also lead you to the same unshakable conviction: Plant management men believe that industry can, and should, take care of its own employment problems. Their plea to top management, to their legislators, and to the public: "Quit looking to Washington for help."

"Manufacturing ca

The roughly 16-million men and women employed in manufacturing plants account for only about one-quarter of the American work force. For the last 100 years this portion of the work force has virtually carried the rest of the American economy. It has produced the biggest portion of our goods and services. It has created the biggest portion of our national wealth. And along with all this, it has provided the most jobs. But in the last 16 years this picture has changed sharply.

Accelerating change—both social and technological—has made economic growth in manufacturing no longer

"Government shoul

Now that unemployment on a national scale has reached uncomfortable proportions, plant management rightfully fears misdirected legislation. It fears such legislation will artificially sustain jobs in manufacturing instead of stimulating job growth in other industries. Plant management has shown that it knows how to take care of the unemployment it generates. It does not believe that legislation can create more jobs in manufacturing. Under a free competitive system, only increased productivity has ever been able to do this.

The men who manage plant operations do not want

"Service industri

As an economic stimulus, the federal government is effective when it serves business as a gigantic clearing house for marketing information and ideas. It is even more effective when it creates a climate that encourages profit making. The present Administration has already shown that it recognizes the former principle. We can only hope that it will be sensitive to the latter. Cure for general unemployment lies not in regulatory legislation, but in national economic growth.

We think it is the service industries that now need government attention, not the productive industries. Manufacturing knows how to take care of and train its

Washington for help"

Plant men make this plea in many ways. For instance: . . . An industrial engineer in a 700-man California electronics plant says, "Let's get Big Brother off our backs. Do away with the welfare state and its accompanying inefficiencies. If left alone, business will provide all the needed jobs without government interference." . . . The personnel director of a large foundry comments, "We don't need high tariffs, government controls, etc. We need less government, lower taxes for all, and fewer government services so we can spend our dollars where we wish, not where the government tells us to." . . . And a motor plant superintendent in Indiana casts his ballot against a shorter work week, government control of prices and wages, and more government spending, because they are "cost-of-living risers." He defends his opinion, "My answers are based on long-range desires, not on the shot-in-the-arm policies so prevalent today."

Analysis of these typical comments and of the survey statistics implies the three-part message below for increasing employment growth on a nation-wide scale.

ake care of its employment problems"

synonymous with employment growth. The manufacturing industry will for a long time continue to be the biggest contributor to the national economy in terms of capital investment, profit, wealth, and taxes. But it will no longer be able to absorb manpower in proportion to its contribution to the material economy.

The manufacturing industry has carried the burden of employment so well for so long because it unfailingly seeks the goal of increasing productivity. It has done so in the face of almost intolerable opposition from reactionary union leadership and punitive tax burdens. In today's challenging times, manufacturing should be permitted to continue to seek the same goals without additional interference.

The plain facts are that automation (plus every other form of labor-saving improvement) affects only a small part (2%) of the manufacturing work force each year. Most plants handle workers so displaced in either of two ways. They (a) increase sales, and consequently production and employment, or (b) permit part of the work force to atrophy by the natural process of quits, deaths, and retirements. It's really just that simple.

how it believes profits make jobs"

handouts from the government. They deplore the supports that are granted to farmers. They resent special concessions granted the mining interests for depletion reserves. And they show real foresight in rejecting the extension of protective tariffs for themselves.

While most management men brighten at the thought of relaxed depreciation laws, they don't fold up and quit their productivity improvement efforts because they don't get relief.

And while almost every American complains about taxes, whether he is in business or not, manufacturers willingly pay high corporate taxes so long as these taxes don't penalize profit-making. The Administration must now demonstrate that it believes that it is *profit* that creates jobs. It can do so by curtailing services no longer suitable, and by deferring those not needed right now.

In fulfilling President Kennedy's request for more defense spending to meet the Russian threat, the Administration above all must be frugal in discharging its responsibilities. And it should always offer each segment of the public an equal opportunity to provide a service for itself before thrusting a service upon it.

ust take up the labor slack"

own displaced people. Manufacturing needs fewer fetters, not more, in seeking higher productivity. Manufacturing has demonstrated its reliability—despite isolated instances to the contrary—in managing its affairs in the best interests of its employees and public.

The service industries (defined as all industries except manufacturing, mining, and construction) should be encouraged to manage themselves better. *They* should be encouraged to improve on their profit margins. It is the service industries that have the most primitive unionism and the least scientific management. It is the service industries that have the highest failure rates and the heaviest employment swings.

Relatively speaking, it is the service industries that hold the most potential for employment growth. It is these industries that can now grow faster under the spur of automation. It is these industries that must take up the slack in the American work force.

For a free copy of this entire article to send to your congressman, circle No. 683 on the Reader Service Card at the back of this magazine.

GETTING MORE FOR THE $$ YOU SPEND ON PLANT

HOUSEKEEPING

Slick stock bins speed daily broom work

Contrary to the general rush toward automation, there are still many housekeeping jobs that can only be done with a hand-powered broom. Sweeping around side-aisle storage bins is one of those jobs. Timken went to its material handling managers and asked help in rearranging parts bins. Neat orderly arrangements that resulted (at right) obviate the need to move stock while cleaning, thus greatly speed sweeping.

Motor sweeper does better over wide aisles

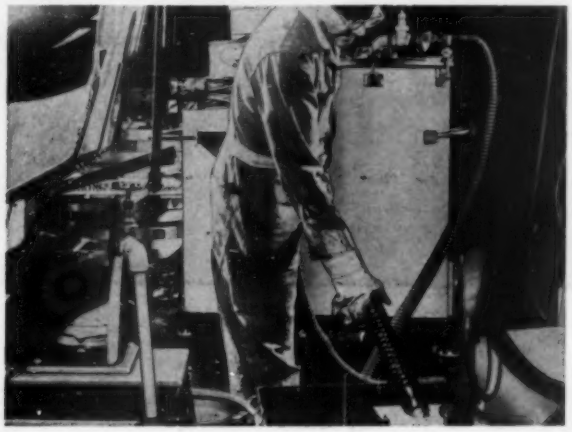
Inside and outside the plants, Timken finds motorized sweepers are best. Before, eight men hand swept the areas outside the plant twice a day. With the new machine, cleaning is still done twice a day, but now requires only three men. Inside its plants, company uses motorized dry scrubber on wood floors. Machine cuts down need for wet scrubbing from twice a week to once. Dry scrubber is faster, prolongs floor life.

Vacuum cleans without dust

When done with a broom the cleaning of screens is difficult, time-consuming, and messy. Dust accumulation in areas surrounding screens being cleaned with broom demanded immediate supplementary cleaning. New tank-type vacuum cuts job time 30%, eliminates residual cleaning entirely.

Big tanks cut draining time 50%

Each week at Timken plants, grinding machines must have a coolant change. Sludge is removed at the same time. In the past a 55-gal.-capacity vacuum was used to do the job. By increasing the vacuum drum capacity to 125 gallons, housekeeping personnel now drain the machine in half the time.



TO AMERICAN HOUSEWIVES cleaning is just a necessary evil. To American plant men it is a staggering job that gobbles millions from factory budgets every year.

The Timken Roller Bearing Company, for example, pays out $2¼-million each year to clean its plants in the United States and Canada. Out of respect for this bill, the company is constantly on the watch for ways to use personnel and equipment more efficiently.

The housekeeping methods improvements you see on these two pages resulted from Timken's continuing cost reduction program. Dollar savings, though not tabulated, are estimated at many thousands.

What's behind the high cost of housekeeping? Timken sees two reasons. First is the sheer volume of cleaning to be done. Second is the frequency of cleaning needed to guarantee top-level plant conditions.

Is it necessary? Absolutely, say Timken managers. Effective housekeeping will always cost. But where a new machine, for example, cuts the cost of doing one housekeeping job, the time saved can be used to initiate or improve another job considered too costly before.

Work-place carts aid scrap removal

At one time two men were assigned to haul scrap by hand truck from each plant department. The operation, including separation of scrap for resale, took about four hours a day. Now scrap is separated at point of origin and dumped into metal containers. It's then picked up by lift-truck operators as they make their rounds. Job is faster and can be done without interfering with truck operators' regular duties.

Hoppers halve paper pick-ups

In many plant areas, paper refuse used to be collected and moved off the floor on hand trucks—four to five times a day. Now big, specially designed hoppers are strategically placed wherever paper is used in packing or unpacking products. A lift truck comes along once or twice during an eight-hour shift and quickly carries the refuse away. Men saved are now available for other housekeeping chores in the plant.

"If any maintenance manager anywhere in the U.S.A. gives me the figures needed for this evaluation form, I'll tell him what kind of maintenance job he's doing, site unseen!"

Grade your ONE-PAGE

Whenever maintenance men get together, we always hear the question, "How can we determine how well we are doing?" or "How can we measure maintenance performance?"

We have devised a rating system at our Corpus Christi plant (Pittsburgh Plate Glass Company—Chemical Division) that answers these key questions to our satisfaction. In fact, we suggest that the extent to which *any* manufacturing plant is able to fill in the statistical data will indicate its degree of sophistication in maintenance management. Furthermore, the availability of the data will provide a reliable evaluation of the plant's over-all maintenance proficiency. Thus, a maintenance manager can use this evaluation to determine his current position and compare it with that of previous months and years. He can use it as a general guide in answering the question: "How am I doing?"

(The one-page scoresheet, shown in miniature above, appears on page 88. Along with it, you'll find item-by-item instructions on how to figure your own maintenance performance.)

This rating system has other advantages:

1. It tips off maintenance management as to where it needs to exert the most pressure—enables it to "manage by exception." For example, the planning and scheduling engineer can look at the indicators used in that general category and pick out the specific area that needs the most attention. Or top maintenance management can look at the general category that has the poorest rating and exert extra effort in this general element of maintenance operations.

2. It permits comparisons among plants in multiplant organizations of similar caliber. Some changes in specific indicators, weights, and scales might be needed. But comparisons could still be made with some degree of reliability.

3. It's a concise and reasonably objective method for reporting to plant executive management the kind of job maintenance is doing.

By **RALPH N. PRICE**, Superintendent of Maintenance
Pittsburgh Plate Glass Company—Chemical Division
Corpus Christi, Tex.

The maintenance evaluation system is the result of our efforts over the past several years to determine the significant factors in maintenance control and evaluation, to devise statistical methods to measure such factors, and to try to use these statistical indicators intelligently in improving maintenance operations. In conceiving the system, we first divided "management control" into five areas of major responsibility. These areas are:

A. Planning & scheduling. The central planning and scheduling operation is handled by maintenance engineering. Although all levels of maintenance management contribute, this is primarily a staff function.

B. Work execution. This is the primary responsibility of front-line supervision.

C. Administrative control. The indicators under this general heading are designed to measure the effectiveness of management control procedures, including preventive maintenance and control of work force.

D. Cost control. The indicators we use under this heading relate maintenance costs to denominators over which maintenance has very little, if any, direct control. We consider maintenance a manufacturing function. These variables are designed to measure the effect of production conditions on maintenance cost, and thus measure our ability to adjust to changing conditions.

E. Labor relations. Responsibilities here are shared by all levels of maintenance management—from the maintenance superintendent down.

USE OF DATA ON HAND

When we had set up these five control areas, we grouped the various indicators under one and, in some cases, two of the general headings. We had already been using most of the statistics for control purposes, although a few were designed specifically for this evaluation system. When an indicator is used under more than one responsibility heading, we consider the primary responsibility to be split as shown. We ended up using 20 indicators for a total of 24 times with none being used more than twice.

erformance with this...

CORE SHEET FOR MAINTENANCE

As previously mentioned, we had been using most of the statistical information needed for this evaluation system as a guide in decision making and for identifying trouble areas. When in 1954 we began using McBee edge-punched cards for maintenance records we started developing various codes for analysis of costs and types of work. So we were in good shape to make the transition to data processing by punched cards when it was installed in our plant late in 1957.

To incorporate this information into a formal appraisal system necessitated establishing ideal performance levels for each indicator, also a scale for evaluating actual performance in terms of each ideal. We also decided to weight the indicators under each major heading to add up to unity and to do likewise to these results when combined for the total proficiency index.

WEIGHTS AND SCALES

The weights we have assigned are a composite of the opinions of top maintenance management and staff. In most cases there was a surprising degree of unanimity. The estimated weights that were extreme in relation to the general concensus were discarded and the rest were averaged. In a practical application of this system we find the weighting of the individual indicators makes little difference in the final results. However, since the weighting might be important under some circumstances we continue to use the system as originally designed. We also find that when the factors are not weighted we usually get a somewhat higher performance rating. So we have concluded that weighting adds some severity to the grading.

The scales were needed to convert actual performance statistics to an empirical evaluation of proficiency that tells "how good" that performance was. We sought to relate each indicator to what we consider perfect maintenance performance in our plant. For example, in appraising work execution, one of the indicators relates to the number of "small jobs (16 man-hours and under) that are 30 days old." This indicator is statistically derived as a percentage of all such jobs originated in the month. We consider zero percentage in jobs 30 days old as the ideal performance (which means 100% proficiency), and 25% as the worst performance (which means 0% proficiency).

In a few cases experience has shown that optimum performance is a better measure of proficiency than maximum and minimum statistical values. For example, we established by trial and error over a period of years that 25 departmental days is an optimum total workload. However, since we believe the department is better balanced with 30 days of work than with 20 days, we have placed different values on these two figures in relation to the performance scale. In such cases the units of ascending and descending scales have different lengths.

The standard of grading can be tightened or relaxed by shortening or lengthening a scale. However, we find the effect of this adjustment decreases as the performance index moves up the scale, and loses significance when a grading is within the upper quartile.

BUILT-IN VERSATILITY

We feel the indicators we've selected, and the ideals and conversion scales we've chosen, will be reasonably valid in any heavy-process manufacturing plant. We realize there are many variations in organization and philosophy even among plants of the same type. And we recognize that some of the indicators will not apply universally. Also, the "ideal" in another plant may not be the same as ours. Setting the top of the scale of any one of the 20 indicators, therefore, is simply a matter of establishing theoretically "perfect" performance under conditions existing in that plant. Where we use the expression "attainable ideal" we mean an ideal we can achieve that is not necessarily a theoretically perfect zero or 100% perfection.

Now, to see the various indicators we use, how they are derived, the selected ideals and scales, and the weights we assign in computing their influence on evaluation of the major factor in which they are grouped, turn the page.

MAINTENANCE EVALUATION SUMMARY

For period: _____

(A) PLANNING & SCHEDULING:

	Performance value	Proficiency index	Weight	
1. Large jobs (over 16 man-hours) 30 days past due (1)	10.0	76	x .15 =	11.2
2. Gross estimating error (2)	31.2	45	x .20 =	9.0
3. Craft workload balance (3)	65	35	x .20 =	7.0
4. Compliance with daily work schedule (4)	65	38	x .20 =	7.6
5. Work effectiveness (repetitive jobs) (5)	100.8	50	x .25 =	12.5

Planning and scheduling proficiency 47.3 — Weight x .20 = 9.4

(B) WORK EXECUTION:

1. Work effectiveness (repetitive jobs) (5)	100.8	50	x .30 =	15.0
2. Compliance with daily work schedule (4)	65	38	x .15 =	5.7
3. Small jobs (16 man-hours and under) 30 days old (6)	3.2	87	x .15 =	13.1
4. Work activity (% idle) (1)	22	45	x .25 =	11.1
5. Gross estimating error (2)	31.2	45	x .15 =	6.8

Work execution proficiency 51.7 — Weight x .25 = 12.9

(C) ADMINISTRATIVE CONTROL:

1. Preventive maintenance (14)	89	82	x .15 =	12.3
2. Total workload (8)	16.9	64	x .20 =	12.8
3. Current workload (9)	11.0	95	x .15 =	14.2
4. Scheduling flexibility (Priorities 1 and 2) (10)	12.9	100	x .15 =	15.0
5. Craft workload balance (3)	65	35	x .20 =	7.0
6. Maintenance expense (7)	1.42	66	x .15 =	9.9

Administrative control proficiency 71.2 — Weight x .25 = 17.8

(D) MAINTENANCE COST CONTROL:

1. Maintenance cost improvement (11)	141	85	x .25 =	21.2
2. Per cent costs of production departments (12)	.58	72	x .35 =	25.2
3. Per cent maintenance costs to sales (13)	16.4	72	x .30 =	21.6
4. Services and expensed improvements (1)	26	35	x .10 =	3.5

Maintenance cost control proficiency 71.5 — Weight x .10 = 7.2

(E) LABOR RELATIONS:

1. Labor turnover (6)	11.5	.54	x .25 =	13.5
2. Absenteeism (15)	2.62	90	x .25 =	22.5
3. Safety (6)	9.09	64	x .25 =	16.0
4. Grievances (16)	1.73	83	x .25 =	20.8

Labor relations proficiency 72.8 — Weight x .20 = 14.5

TOTAL PROFICIENCY

61.8

Note: Numbers in parentheses refer to scale on nomograph.

A filled-out maintenance score sheet is on the facing page. Below, you'll find an item-by-item description of the data needed, the method of calculating proficiencies, and the weight given to each. Everything you need to find your own maintenance efficiency is here.

However, we have simplified the conversion of statistical performance values into proficiency values with a multi-nomograph (not shown). It contains all 20 indicators. To convert any performance value, we spot it on the proper scale and read the proficiency index directly. For example, a score of 4 on scale 16 (grievances) rates a proficiency index of 60.

(Editor's note: The author will send a copy of this nomograph to readers who write him directly. It will also be included in reprints of this article.)

A. PLANNING & SCHEDULING

1. Large jobs (over 16 man-hours) that are 30 days past the estimated finish date. This is expressed as a per cent of the jobs in this size bracket originating during the appraisal period.
Scale: zero (ideal) to 40%; weight: 15%.

2. Gross estimating error. Sum of all the differences between estimated hours and actual hours (whether high or low) for each craft on each job, divided by the estimated hours.
Scale: 20% (attainable ideal) to 40%; weight: 20%.

3. Craft workload balance. A somewhat arbitrary index, derived by averaging the workload (in shop-days) of the two highest loaded crafts, then subtracting the average of the shop-days of the two lowest crafts, and dividing the difference by the high-craft average.
Scale: zero (ideal) to 100%; weight: 20%.

4. Compliance with daily work schedule. We compute per cent compliance (jobs completed vs. scheduled) using both man-hours and jobs. The value taken is the product of these two percentages. Our optimum is a rating of 90%. We schedule full each day and consider it impractical, if not undesirable, to expect 100% compliance. We believe the daily schedule should not be a mandate if front-line supervisors are to accept their share of responsibility.
Scale: 90% (ideal) to 50%; weight: 20%.

5. Work effectiveness. We carry a five-year running average of man-hours expended on all repetitive jobs. The jobs occurring in a given month are compared to the five-year average. Results of these comparisons are weighted by relative size of jobs, and the sum of the weighted percentages is used as a measure of work effectiveness for the month.
Scale: 80% (attainable ideal) to 100% (or unity) at midpoint to 120%; weight 25%.

B. WORK EXECUTION

1. Work effectiveness (see A-5); weight: 30%.

2. Compliance with the daily schedule (see A-4); weight: 15%.

3. Small jobs (16 man-hours and under) that are 30 days old. Expressed as a per cent of the job requests in this size bracket that were originated during appraisal period.
Scale: zero (ideal) to 25%; weight: 15%.

4. Work activity. We use work sampling for measuring the activity of maintenance workers. We try to carry on a work sampling program 25% of the time and use the most recent results for this rating, based on non-productive activity.
Scale: zero (ideal) to 40%; weight: 25%.

5. Gross estimating error (see A-2); weight: 15%.

C. ADMINISTRATIVE CONTROL

1. Preventive maintenance. Per cent of the total mechanical work done as preventive maintenance on production equipment. The raw data we use here include only the man-hours worked on equipment that are covered by the PM program. While we do not think we can afford 100% reliability even on the equipment used in this program, we have set an ideal of 100% performance. To express this another way, we grade on the basis of no erratic work on equipment that is in the program. We believe erratic maintenance should be held to such a low figure that the 100% PM performance ideal is not unrealistic.
Scale: 100% (ideal) to 40%; weight: 15%.

2. Total workload. Expressed in departmental days, to show total man-hours of approved work related to the daily man-hours available. The 25-day optimum is by no means arbitrary. We started out at 15 days some years ago, went to 20 days, and then to our present 25 days. By trial and error we have found our greatest flexibility and most efficient operations to be at about the 25-day level.
Scale: 25 days optimum to zero on ascending side; 25 days optimum to 75 on descending side; weight: 20%.

3. Current workload. Defined as work immediately available for which manpower should also be available. This is the best we have been able to do in arriving at an "availability index." Work orders estimated at 16 man-hours and under are put immediately into the current backlog, and larger jobs are accumulated on the basis of predicted equipment availability and priority. Basically, we want to make sure there are always 10 days of work immediately available.
Scale: 10 days optimum to zero on ascending side; 10 days optimum to 30 on descending side; weight 15%.

Turn the page

4. Scheduling flexibility. Percentage of scheduled work that must be done at a time set by production. We consider this to be one of the major problems in maintenance administration. Our priority "1" covers emergency work, and priority "2" is defined as important shut-down work that must be done at a time set by production. As an ideal, we should like to hold the hours worked under these priorities to 20% of the hours scheduled centrally.

Scale: 20% (attainable ideal) to 50%; weight: 15%.

5. Craft workload balance (see A-3 on preceding page); weight: 20%.

6. Maintenance expense. Derived by dividing the total expense of operating the maintenance department, including employee salaries up through the maintenance superintendent, by the total hours worked by hourly wage earners in the department. In other words, maintenance expense is expressed as dollar expenditures per man-hour worked.

Scale: 75¢ (ideal) to $2.75; weight: 15%.

D. MAINTENANCE COSTS

1. Maintenance cost improvement. For this we compare all charges made to a maintenance account in all the production cost centers to the total for the same period the previous year.

Scale: from a minus 20% (ideal) to a plus 20%; weight: 25%.

2. Per cent costs of production departments. For this we measure per cent of maintenance man-hours worked in production cost centers. We have in our accounting code book approximately 50 cost centers, and only 10 of these actually produce something that goes into a salable product. So, here we are trying to measure and control maintenance expenditures that go into plant overhead. Top of our scale is 80%, which we admit is highly idealistic.

Scale: 80% (ideal) to zero; weight: 35%.

3. Per cent maintenance costs to sales. Dollar maintenance expenditures that are expressed as a percentage of sales.

Scale: 5% (ideal) to 45%; weight: 30%.

4. Services and expensed improvements. Relates maintenance charges for "services" and "expensed improvements" in the production cost centers to the total maintenance expenditures in these centers. From strictly a maintenance viewpoint (and possibly a selfish one) we should like to hold this to zero, but recognize there will always be some work of this kind.

Scale: zero (ideal) to 40%; weight: 10%.

E. LABOR RELATIONS

1. Labor turnover. We project the number of hourly wage maintenance men terminated each month to a yearly basis and divide by the men on the payroll. Deaths, retirements, and transfers are not included.

Scale: zero (ideal) to 25%; weight: 25%.

2. Absenteeism. This measures job interest, so we do not consider absentee hours significant when the average per case exceeds 20 hours. Thus, the two rather complicated formulas below emphasize number of cases. Value when ratio of total hours to cases is . . .

. . . greater than 20:

$$\frac{\text{Absentee cases}}{\text{Man-hours worked}} \times 1000$$

. . . less than 20:

$$\frac{\text{Absentee cases} \times \left(\frac{\text{Absentee hours}}{21 - \text{absentee cases}}\right)}{\text{Man-hours worked}} \times 1000$$

Scale: 5 (attainable ideal) to 55; weight: 25%.

3. Safety. Score is established by what we call a "demerit" system:

- Clinic (in-plant) cases per 1000 man-hours worked = 1 demerit.
- Doctor (out-of-plant) cases per 1000 man-hours worked = 50 demerits.
- Lost-time accidents per 1000 man-hours worked = 1000 demerits.

The doctor and lost-time cases are carried total to date during a calendar year. Thus, all cases of this nature penalize the department for the entire year.

Scale: zero (ideal) to 25; weight: 25%.

4. Grievances. Computed by dividing the number of formal grievances by the total hours worked by the department divided by 100,000. These figures are also carried total to date for a calendar year.

Scale: zero (ideal) to 10; weight: 25%.

It is obvious that important segments of maintenance operations are not covered by this system. For example, the determination of "when" each maintenance job should be done is among the most critical of the day-by-day decisions that must be made by manufacturing management. Also, no maintenance job should be approved unless it is considered essential to efficient plant operation or to prevent deterioration. But no job in these categories should be left undone. Even though there is no specific indicator for measuring performance in this area, there are several that we believe have a direct relationship. In fact, all 20 indicators are invaluable in pinpointing other maintenance activities in need of improvement.

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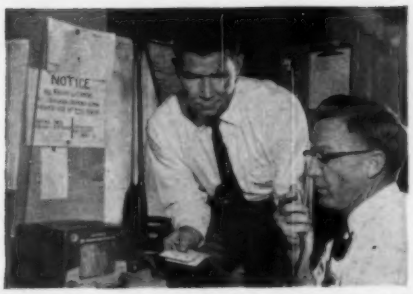
RADIO-EQUIPPED TUG pulls in load of test equipment at the (quarter-wave) antenna clears bomber wing undersurface. B-58 flight line at Convair, then calls in for assignment. Short



CONTROL center for the 10-unit communications system is this $75 (normally $150) citizens' band radio in Convair's test office.

AT HOME or in downtown Ft. Worth, the finishing department foreman can be in touch with his crewmen whenever he's needed.

Citizens' radio cuts dispatch time

TWO-WAY RADIO phones (citizens' band) have saved General Dynamics' Convair Division in Fort Worth, Tex., thousands of man-hours in a few months.

Convair's electronics test department uses the citizens' band (CB) units just like any other of the more expensive two-way business radio equipment. It had to solve the same problems that have limited CB's wider use by industry—low power, uncontrolled interference.

Electronics test personnel frequently work as far as two miles from department headquarters. There's no predicting what special technician, instrument, or component may be needed when a problem comes up. In the past, testers had to walk to the nearest phone (not very near either, when the plane under test is on the flight ramp) and try to locate the needed man or equipment. This often took up to two hours.

Now the only delay is for actual transportation. Two CB sets using full-size antennas, one at department headquarters, another at the test equipment crib, serve as control and equipment dispatch centers. Portable sets with less efficient, but convenient, whip antennas are installed in the department's pick-up, tug, tram, van, mobile testers, and the foreman's car.

Interference from other users on Channel 11 caused considerable chaos for the first month or two. But most local CB users switched to other channels when the word got around that Convair needed it. Convair still has to wait at times for the channel to clear. But if the delay is excessive, it simply cuts in. Furthermore, Convair's messages usually take only a few seconds. A numerical code for routine messages saves time over the typical conversation style of phone calls. (For instance, "10-21" means "call this station by telephone"; "10-98" means "finished with last assignment.")

The low power (5-watt) handicap of CB equipment was solved by using split antennas at the control centers. One antenna on the roof, another near ground level assure dependable communications up to several miles.

Because of security, messages are generally limited to routine requests. Specific test problems are discussed only by telephone. Even then, time is saved because the right man is already located.

The original sets purchased were discontinued models and cost only $75 each. However, H. O. Lockett, assistant department foreman, cautions other plants about starting CB operations with too limited a budget. Bargain equipment may limit the operating flexibility you need under plant conditions.

Convair has had no need for any maintenance yet, and has found special shock mounting unnecessary.

Traveling workbench goes wher

An entire assembly line, including machines, can be changed in four hours at a cost of $50. This is the job-shop flexibility Eastman Kodak has incorporated into its mass production assembly lines with the movable workbench.

Fixed, inflexible assembly lines were not able to cope with a number of problems—increasing model changes, smaller lot sizes, seasonal production demands, and limited space. Principal lines affected were assemblies of cameras, projectors, and color printers at two Kodak plants—Hawkeye Works and Camera Works, Rochester, N. Y.

The movable workbench means that assembly-line layouts can now be changed economically several hundred times per year. No undue workload is placed upon the maintenance department because the operation is easy and quick. Thus, both production and maintenance applaud the system.

BUILT-IN VERSATILITY

The movable workbench is a universal unit work station. It consists of a steel base with legs and removable accessories such as a bench top, a pneumatically powered punch press, a utilities supply panel, racks, sections of roller conveyor, and the like.

The bench works two ways. It may be disassembled and completely removed from the assembly line or some of the accessories may be removed and exchanged for others.

Use of the movable workbenches enables department supervision to arrange assembly lines in accordance with schedules, space, and work load without high cost or confusion. When a change in product mix is required, the supervisor checks the production forecast, standard cost book, labor load forecast, and time schedule to determine the layout of his new assembly line. With this in mind, he sketches a flow chart with benches, machines, conveyors, and crossovers to fit the space available. The maintenance department assembles the workbenches accordingly, parallel or in line, with gaps or continuous bench surface.

TAILORED TO SUIT

Both the Camera Works and the Hawkeye Works use the movable workbench, devised by Charles Clutz, superintendent of the assembly department of Kodak's Apparatus and Optical Division.

Benches at the Camera Works are designed for mass production and assembly of relatively small parts for cameras and projectors. This style has a 2x5-ft. fiberboard top, to which various pneumatic assembly machines can be attached by means of a standard mounting plate. Plumbing to supply lubrication and filtered air to the machine is mounted on a portable utilities supply panel below the bench top. This, in turn, is connected by snap fittings to any nearby source of air, vacuum, and electricity.

Some of the Hawkeye Works' benches, on the other hand, have permanent plumbing and utilities fixtures, so they can be coupled together to form a continuous utilities pipe line. A single utilities source can service up to 200 feet of benches.

Assembly machines can easily be installed on the line. Punch presses are mounted on standard metal plates, which all workbenches are drilled to receive. When a press is required in a certain location in the assembly line, the bench top in that spot is unscrewed from the frame base and is manually carried away to storage. A light-duty lift truck carries the bench top with press attached to the vacated location. The bench top is then bolted on and a foot treadle is clamped to the bottom of the steel frame. A utilities supply panel is similarly positioned and connected.

The steel base of the bench is preengineered so that racks may be easily bolted in place beneath the bench top for space-saving parts storage. These same fixtures act as supports for roller conveyor crossovers, when two production lines merge. With minor changes, the fixtures can be used as supports for conveyors, when the latter are mounted on top of the benches.

it's needed

END-TO-END BENCHES are set up at a subassembly station along a parts conveyor. They have been temporarily equipped with racks and punch presses.

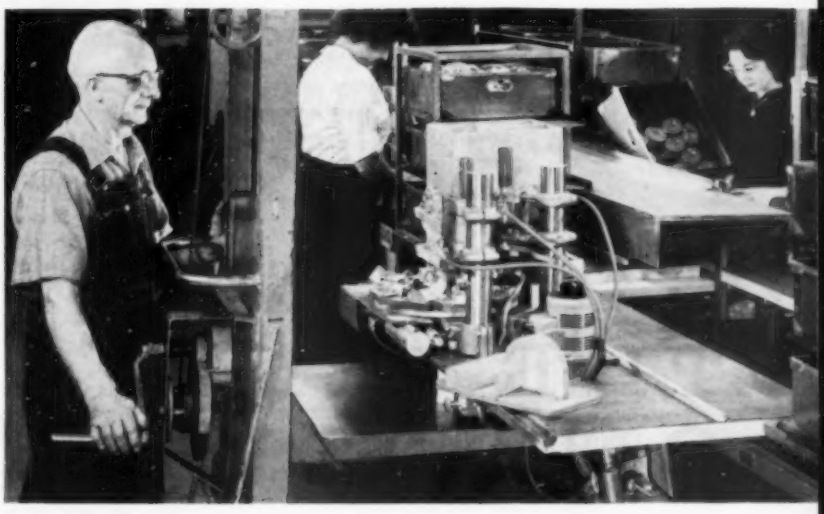
Single benches are cemented to the floor for stability. Heating the joints at the four legs with a propane torch loosens the cement for easy removal of the bench.

TWO-WAY PAYOFF

Several hundred bench changes are made each year at both plants. Since the average assembly line is 25 benches long, the movable workbench approach has reduced cost per line changeover from $375 to $50, a saving of $325.

Maintenance labor, which handles all bench moves and set-ups, has been saved in two ways. First, fewer maintenance personnel are required, since it takes only 15 minutes to relocate the simplest bench. Second, emergency maintenance staff has been considerably reduced. When a punch press breaks down on assembly, it can be replaced in one hour without shutting down the entire line. Former methods required 12 man-hours. Since the defective press can now be repaired in the shop without overtime or rush procedures, repair costs have dropped significantly.

Management is obviously satisfied with the program; some 500 such benches are in operation. Cost of each bench is $125. Other alternatives were considered, but none gave Kodak the flexibility and the low cost of the movable workbench.



OFF THEY GO as rearrangement of a line is accomplished with the aid of a lift truck. Operator picks up the bench top with components attached to it.

BACK ON THE JOB, single benches have been mounted with other components and temporarily put to work on both sides of a portable two-tier conveyor.

Quality control at one quick glance

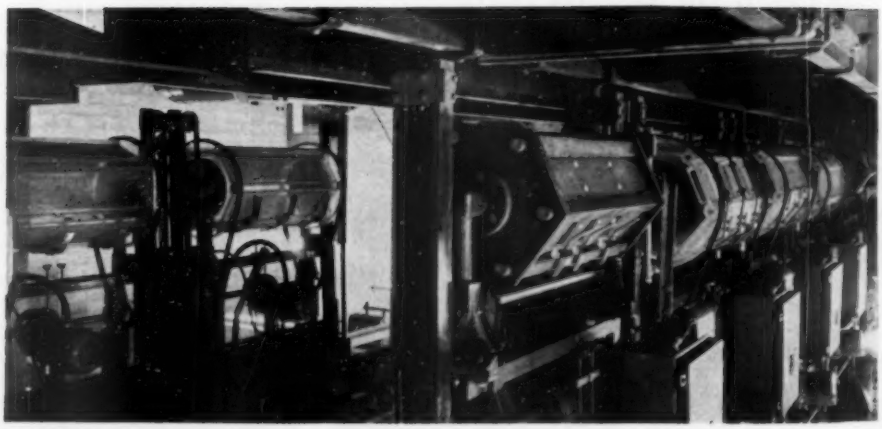
When quality starts to sag, both workers and management find out about it in a hurry. Inspectors switch on quality control lights that shine both on the production line (right photo) and in the assistant plant superintendent's office (above). Code: green, work's fine; amber, needs more care; red, poor.

HOLDING THE LINE ON COSTS

A generous dose of ingenuity is the antidote for rising operation costs at Minneapolis-Honeywell Corporation's Twin Cities, Minn., plants. Here's how management ideas slashed overhead and improved operating efficiency.

Spotting faults ultrasonically

Potential accidents and costly downtime are nipped in the bud with this ultrasonic tester. It's used to check crankshafts, locking pins, and clutches of all 66 punch presses with rolling key clutches. Faults or cracks can be easily spotted on the oscilloscope. All suspects are then replaced immediately, before they can cause trouble. Inspections are held on a regularly scheduled basis—each press gets checked every four weeks. The ultrasonic tester is manufactured by Sperry Products, Inc., Danbury, Conn.



Automatic anodizing with the flip of a switch

This barrel-plating machine completely automates zinc plating. Parts are tumbled in rotating plastic barrels and dipped in each bath for at least two minutes. However, any station can be skipped with a flip of a switch. Plating dips last 8, 16, or 24 minutes. The sequence is: alkaline soak, electrocleaning, warm rinse, acid bath, and another rinse. Then the parts go through a cyanide bath, zinc plating, salvage, rinse, bright dip, chromate, rinse, and a hot rinse before they are unloaded. The barrel-plater is manufactured by Crown Rheostat & Supply (Chicago).

Turn the page

Robot loader saves fingers—ups output

Production has been upped 30% and danger to nipped fingers eliminated since this automatic part loader was installed on the centerless grinder. Here's how it works: Work is placed in the loader and the hydraulic piston moves it down between the grinding wheels. This used to be done manually by the operator. Besides being slow, fingers were often nipped by the whirling wheel. And if a part were dropped, chances were the wheel would break. With the loader there have been no injuries to wheels or hands.

Fishing tackle box keeps parts safe

Ordinary fishing tackle boxes team up with urethane to keep small precision parts safe without large expeditures for padding. Comparatively expensive wooden trays (right of photo) costing $5 were used before. The tackle box costs 60 cents. Parts are now set in resilient urethane liners (30 cents each) with a liner (10 cents) placed under the lid. When the tackle box is closed, the liners are under a 10% compression. This means the parts cannot shake loose or touch each other. In fact, boxes can be dropped without damaging the parts.

Racks are fumbler's delight

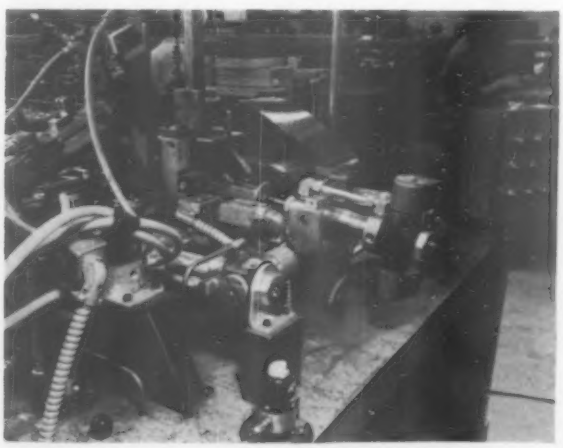
There's no fumbling for a part during assembly operations with these racks (right of photo). They hold all the components needed for one worker's assembly operation. The racks are placed in the order in which the parts are needed, and they are interchangeable. When the operator starts a new operation, the stockman simply removes the rack and substitutes another. Finished items are placed on lazy Susan.

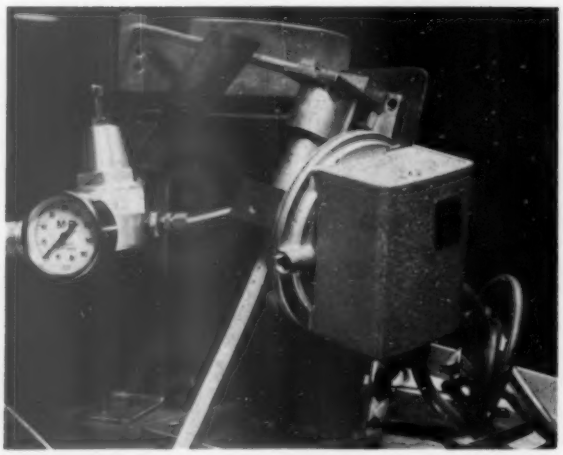
Safety shield shoos sparks

There's no need to sacrifice vision for safety or vice versa in spot welding with this safety shield. The welder has a clear view of the operation without need for a mask. There's indirect illumination inside the shield that shines on the work piece and eliminates the possibility of vision-impeding glare. The operator can inspect the work without danger to the eye from sparks or flying bits of metal.

Impatient winder speedily handles four coils at a time

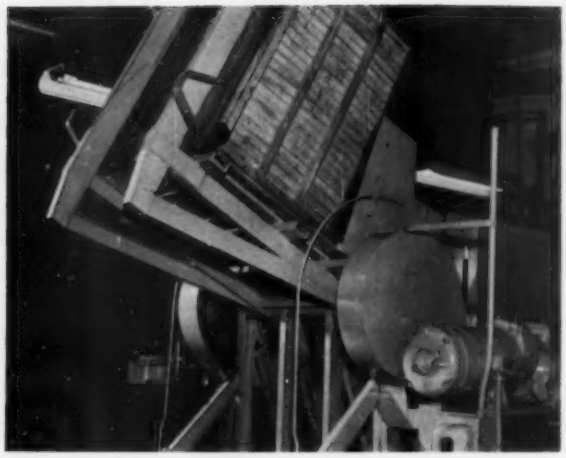
This coil-winding device (right photo below) takes the operator out of the picture. In the past, mechanical winding machines (left photo) required the worker to wind each coil individually—too slow an operation to meet expanding production needs. Now the automated machine—controlled by a battery of miniature precision switches, relays, and motors—winds four coils at a time. And it does the quadruple operation faster than the old single-action winder plus one worker.





Feeds by air to boost production 150%

A portable air-operated feeding system for thread-rolling machines has upped output 150%. The Syntron hopper feeds parts one at a time through a spring into a nylon chute. Low-pressure air blows through the chute to a pneumatic valve. When the chute is filled, the airflow stops, the valve closes the hopper. When parts in the chute drop below holes, air blows through perforations, strikes valve, opens hopper.

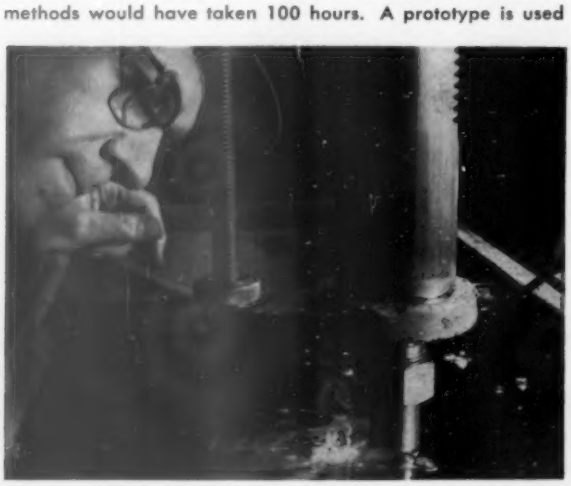


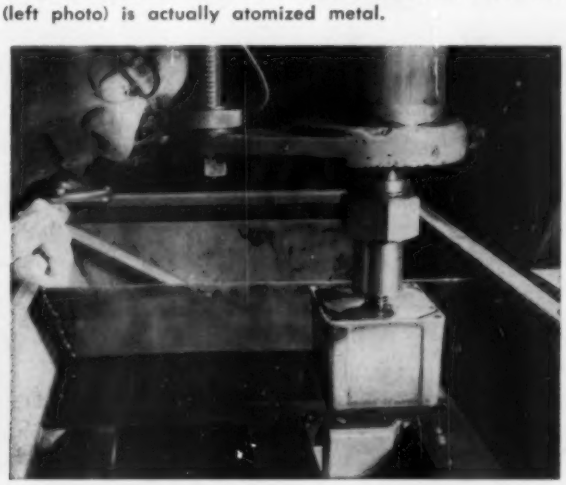
Tilts without touching

This crate tilter at a chucking machine enables the operator to feed parts into a hopper without muscle-power. The crate is placed onto the tilter by fork truck. Then the operator just pushes a button to tilt the crate, thereby dumping the parts into the hopper. This particular tilter is powered by a ½-hp. electric motor. However, other tilters are activated by pneumatic drives for greater speed.

Dies by disintegration in one-eighth the time

Die-forming by electrical disintegration has slashed the cost of the operation by one-third. And this sophisticated die took only 12 hours to make with a five-micron finish. Conventional methods would have taken 100 hours. A prototype is used as an electrode. High-voltage current disintegrates the metal to make the die, with special oil serving as current-carrier to complete the circuit between electrode and metal. The smoke (left photo) is actually atomized metal.





AUTOMATIC WAREHOUSING—WHERE AND HOW SOON?

An editorial commentary

BY ROGER W. CHRISTIAN
INDUSTRIAL MANAGEMENT EDITOR
FACTORY

From computer specialist through a stint in heavy industry to writing for the atomic energy field, Roger has long been a student of technology and management. An active member of several professional societies, he is currently working toward a graduate business degree. He is also writing a book on data processing systems in manufacturing.

Automatic warehousing is no longer the side-show freak it was five years ago. By 1965, the annual investment in automatic warehousing will be eight times what it is now. The time has definitely come to keep an eye on developments. For some firms, the time has come to take action. Which firms? In general, those with a combination of wide product line and heavy volume. But a lot of other things must be considered too, and considered very carefully. The price of admission is usually at least $250,000, so the show better be good.

Warehousing is a natural for automation. For one thing, about half the total cost is labor. For another, it's purely an expense item—it doesn't add a nickel to the value of the product. The total cost is hefty —$20-billion a year—and putting on weight. United Airlines estimates that warehousing eats up about 6% of the sales dollar, and that's probably conservative.

With the stakes this high, it's not surprising that companies with automatic warehouses have been able to wring out annual savings running well into six figures. On the other hand, some companies, as usual, have gone about it the wrong way, with grievous results. The only safe way to pluck a thistle is to grasp it firmly the first time—and the closer to the roots, the better.

Is automatic warehousing for you? That depends on a lot of things, including your product line, distribution system, costs, present investment, company policy, industry practices, and so on. Technology in this field still has a long way to go, but even today it's mechanically feasible to automate the handling of a great many items, ranging in size from a cubic inch to a cubic yard; in weight from an ounce to 64 pounds. Whether it's *economically* feasible in any particular case is another matter. Generally, it's not practical with a small number of items, even if volume is high. Or with a large number of low-volume items. This much is certain—the higher the turnover, the better.

The advantages of automatic warehousing—especially on the order-picking end—include lower costs, more efficient operations, better customer service. Each of these results from several factors. Take costs: A warehouse employing 20 men should be able to cut back to 10. And there should be generous space savings (see "This Is ADMOS," FACTORY, June, '61, page 104). By combining automatic warehousing with air freight, you may be able to eliminate some warehouses altogether. You can slash paperwork, even trim utility costs.

Pacing output to machine speeds, rather than to manual order pickers, can make operations far more efficient. You can all but eliminate human error; reduce damage, theft, spoilage. And a good mechanized system meshes smoothly with a data-processing set-up. On the other hand, mechanized systems tend to be inflexible and demanding. Downtime seems to be designed right into some of them.

It's very important to use the systems approach in overhauling this function. After all, a warehouse is just a buffer between production (supply) on the one hand and sales (demand) on the other. You may find that the savings you get from producing to economic order quantity (EOQ) in the plant are being wiped out by the cyclical holding costs in the warehouse. Or take Du Pont: A check of its warehousing led to packaging redesign that saved half-a-million dollars the first year.

Automatic warehousing will spread rapidly once gear, designed *as a system* to do the job, is available. Right now, the main equipment suppliers are small conveyor manufacturers who are more or less committed to piecing stock hardware together. We need a bold new approach to the whole warehousing function. Equipment on the way will bring major advances in the next few years. Meantime, like the man said, it's time to keep an eye on developments.

A

FACTORY

ENGINEERING AND TECHNOLOGY REPORT

STEEL SHELVING

NO. 13

STEEL SHELVING

Getting the most out of your steel-storage equipment dollar requires careful study of the five main factors involved: types of shelving, storage systems, shelving capacity, layout efficiency, shelving costs. With this know-how, you are well on your way to winning your storage battle.

How to select your shelving

There are two basic kinds of shelving sections—quick-fastening and bolted. This may seem too simple a definition, but it's a fact that the way shelving is assembled often determines its selection. Quick-fastening shelving is slightly more expensive than bolted shelving, but it costs less to assemble and erect. What's more, boltless shelving can be rearranged in minutes to adjust shelves, because a simple fastening device is used instead of nuts and bolts. Boltless shelving is preferred for heavy loads and where inventory requirements change frequently.

But if your shelving layouts are permanent, and low initial cost is important, standard bolted angle shelving may be your best bet. Remember, though, bolted shelving takes longer to assemble and rearrange and lacks the flexibility of quick-fastening shelving.

Both types of shelving come in a wide range of sizes and storage capacities. Also, many optional components and accessories can be added to each to increase its utility. The following guide to components and accessories is illustrated on the facing page:

Shelf dividers and partitions. Provide individual storage spaces on a single shelf for different items. Can be attached anywhere on the shelf on 1-in. centers.

Label holders. Two common styles: full-shelf width and snap-on. The first holds a number of labels; the second holds only one. The snap-on type can be attached or removed quickly for inventories that change often.

Bin fronts. Prevent small parts from spilling over into aisles. Attach easily, use spring fasteners or nuts and bolts. Standard sizes range in height from 1 to 6 inches.

Base closures. Fill the space between the bottom shelf and the floor. Make installations neater-looking, prevent objects from rolling under shelves.

Knee braces. Provide clear access to shelves from front and back while giving needed support. Attached at all four sides where the shelf meets the upright.

Shelving boxes. Provide neater storage for small quantities of small parts. Arranged six-to-a-shelf in standard shelving sections. These boxes have handles, label holders, slotted sides for the insertion of box dividers.

Ledge units. Used to increase the lower shelf space. At same time, provide convenient ledge top, at working height, for handling and sorting material.

Floor shoes. Protect against floor scarring. Made of heavy-gauge steel, they're attached to the bottom of shelving uprights. Also make it easy to slide shelving racks small distances.

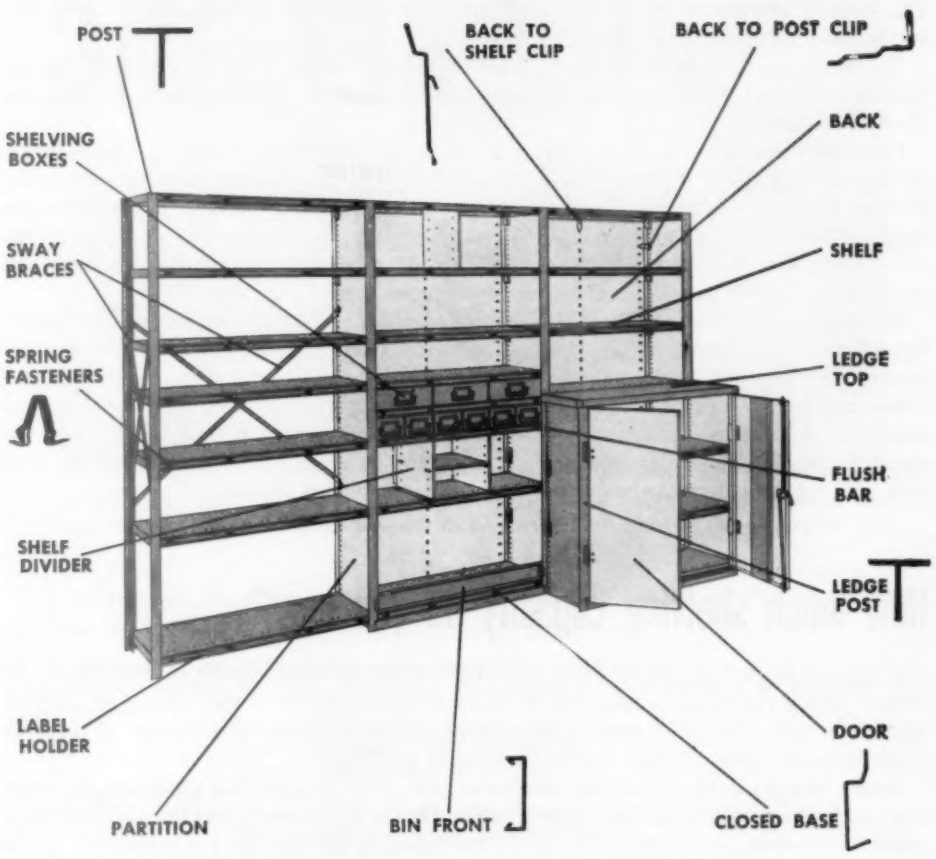
Doors. Equipped with three-point locking devices and hinges that are internally bolted to shelving uprights. (Sliding doors are preferred by some for safety.)

Pilasters. If appearance is important, you can mask hole-studded uprights with these cover strips. Snap onto uprights, or onto clips that are bolted to uprights.

Tool storage inserts. Used mainly in stockrooms and tool cribs; provide visible, individual storage for mandrels, bits, clamps, drills, gauges, and other machine-shop necessities. Over 100 individual tool compartments may be had in one unit.

Drawer case units. Provide convenient, easy-to-get-at storage for many small parts in one self-contained unit. Standard units contain either 18 or 24 drawers, each of which can be subdivided many times.

ASSEMBLY OF STANDARD SHELVING PARTS



Counters. Counter top is handy for paperwork and parts issue while the shelf section below is convenient storage area for catalogs, forms, etc. Made in both bolted and quick-fastening styles. Standard height of counter sections is 39 inches. Any length is possible by joining counter sections together.

It might be useful at this point to mention briefly the specialty shelving systems—although space does not permit us to cover them in detail. There are three types:

Slotted angle framing is relatively new on the shelving scene. Its real impact on in-plant storage has not yet been fully explored. This would require an article in itself. At present it is finding widest use for storage of big-cube, little-weight bulk items. With some ingenuity it can be used for almost any random storage problem. It's relatively inexpensive. It's intended for do-it-yourself installation. According to most experts, once you start engineering a slotted angle installation, the cost advantage is lost. It comes in various thicknesses (0.080 to 0.104 inches) and has four prepunched holes per foot of length. A portable cutter provides in-the-field service.

Mobile shelving is essentially a custom item. In effect, it is dolly-mounted standard steel shelving riding on specially built tracks. It is used mostly for slow moving or dead storage, such as records and warehouse. It has higher initial cost than standard shelving, but is valuable where square-foot floor space is at a premium.

Mezzanine (or second-floor) shelving also increases storage space where floor area is limited. It generally houses slow-moving or dead storage. You can install it wherever at least 15 feet exists between sprinklers and top of standard 7-ft. floor-level shelving. Shelves are laid in direct correspondence with units on floor. Open steel flooring is first positioned over existing shelves. Ground shelves must be of highest quality "T" column construction. Otherwise, additional supports, such as lally columns, are needed.

Turn the page

What type of storage do you need?

The shelving you install depends on the shape, size, weight, lot volume, frequency of use, and turnover of the material you intend to store.

Therefore you should first classify your materials according to the one best storage method available. **There are three general types of storage: (1) open shelf; (2) bin; and (3) box or drawer.**

Open shelf storage—The basic shelving section with its flat shelves is often a logical choice for storing such bulky items as trays, packages, cartons, jigs, fixtures, dies, and other individual materials. In planning open-shelf storage, pay attention most to the depth of the shelf and size of the opening required. These dimensions are determined according to the amount of cubic feet of storage space required in each shelving section. Normally, an optimum shelf depth and width are selected in the first stage of planning.

Bin storage—For handling large lots of small identical parts, bin storage is most effective. Since items like these usually have a fast turnover, storing them loose in bulk quantities permits easy removal and re-filling.

Box and drawer storage—Very often it is necessary to store a small quantity of a great number of different and separate items. These are usually stored in shelf boxes or drawer cases. Depending on size and quantity, a single box or drawer may be allocated for each item. Or, using dividers, the box or drawer may be subdivided to hold several items.

How much shelving capacity do you need?

The number of shelving sections you need depends on the total volume of materials to be stored. This is expressed in cubic feet of materials and is related to the capacity of shelving sections in cubic feet. Use your stock record cards to determine the number of different items on hand. Then calculate the total volume of each item.

Here's how it's done. Count the number of pieces of one item in a container of known size (such as an existing storage bin or a box). Divide this number into the total inventory count on the stock record card. The result, multiplied by the capacity (in cubic feet) of the container, gives you total volume for that part. Adding these results gives the total volume of materials to be stored.

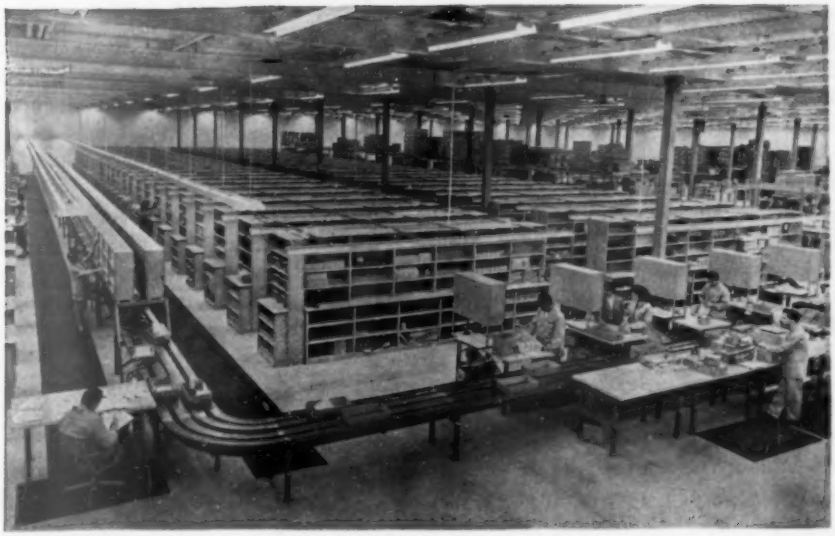
This method works for most materials. However, fixtures, jigs, dies, and other bulky items are often measured more conveniently in terms of lineal feet of shelf space. This is done by counting the number of items needed to fill one shelf, with minimum wasted space. For example, if you figure that a standard die requires a space measuring 6x14x10 inches, then six of these dies will just fill a 36-in.-wide shelf with a 12-in. opening. Some authorities feel this is squeezing it a bit. They suggest storing one less die, thus allowing at least 2 inches of space at either edge. If the shelf is 18 inches deep, six dies would occupy 4.5 cubic feet.

After you have determined the total volume of cubic feet of the materials to be stored, the next task is to break down these materials into the type and amount of storage you must provide. That is, what percentage of this total volume is to be stored in bins, boxes, drawers, or open shelves.

For example, if 30% of your materials can be stored in bins, then 30% of this total volume in cubic feet is the amount of bin-storage capacity required.

With these subtotals you can determine the number of shelving sections you will need. But you must first adopt a basic shelving section with a given capacity in cubic feet. For example, a shelving section 36 x 18 inches x 7 feet 3 inches contains 31.5 cubic feet and has seven openings. Fitted with a 6-in. bin front, however, each shelf has a level capacity of 2.25 cubic feet. Therefore, the total capacity of this section for bin storage is only 15.75 cubic feet. This same section, however, fitted with shelf boxes or drawer cases, would contain 31.5 cubic feet.

Here's how a typical in-plant situation might look. Suppose you have a total volume of 3000 cubic feet of materials to be stored. Using the same shelving section described in the preceding paragraph (36 x 18 inches x 7 feet 3 inches) and allocating 30% for bin storage,



SOPHISTICATED SHELVING installations save money, speed handling from stores to shipping. Use of quick-fastening shelving builds maximum flexibility into this engineered job.

30% for box and drawer storage, and 40% for open-shelf storage, here's how you would calculate the number of sections needed:

1. **Total volume of materials handled—3000 cubic feet.**
2. **Percentage handled by types of storage (normally, 25% would be aded for expansion peak loads, etc.):**
   a. Bins—30% = 900 cu. ft.
   b. Boxes and drawers—30% = 900 cu. ft.
   c. Shelves—40% = 1200 cu. ft.
3. **Storage capacities per section**
   a. Bins—15.75 cu. ft. (60-in. bin front)
   b. Boxes—31.5 cu. ft. (6-in. shelf openings)
   c. Drawers—31.5 cu. ft.
   d. Shelves—31.5 cu. ft.
4. **Number of sections per type of storage: (number rounded)**
   a. 900 cu. ft. in bins ÷ 15.75 = 57 sections
   b. 900 cu. ft. in boxes and drawers ÷ 3.15 = 28 sections
   c. 1200 cu. ft. on shelves ÷ 31.5 = 38 sections

After you've found the number of sections you need, consider the advantage of arranging each shelving section to include one or more types of storage. A good working arrangement for composite sections is to place open shelves at the top and bottom, with bins, boxes, or drawer cases in the center. When setting up sections, store slow-moving materials at the top or bottom of sections to minimize reaching or stooping; fast-moving items in the center at working height; and heavier items beneath lighter items.

How do you plan an efficient layout?

Your next step is to plan an efficient storage system layout. Best way is to sketch out a rough but comprehensive floor plan. On it position accurately entrances, windows, various production and handling operations, obstructions, and the available storage area. Then draw in shelving sections according to the following main points:

Single- or double-faced units. Fit single-faced sections flush against walls and narrow areas. Use double-faced on aisles. Single-faced don't fully utilize floor space.

Working space. Don't use up all the available floor space for shelving sections. Leave space near the entrances for shipping and receiving activities. If you have too many sections for the space available, consider double-deck, mezzanine shelving.

Aisle traffic. Provide a main aisle through the center of the shelving racks. From it extend cross-aisles at right angles with adequate width for vehicle travel. If you operate fork lifts

STEEL SHELVING

in the main aisle, provide space for two vehicles to pass. Cross-aisles should be wide enough for single vehicles, but not narrower than 30 inches.

"Dead-end" aisles. Don't lay out storage-rack aisles to "dead-end" against a wall or another rack. This forces workers to make a complete circuit around a rack to get to an adjoining aisle. Stop rack layouts at least 3 feet from a wall or another rack. To reduce excessive aisle traffic, it's also a good idea to limit the length of each continuous rack. Overly long racks force stock pickers to walk unnecessary distances to reach adjoining aisles. A satisfactory rack length in most installations is from 20 to 30 feet.

Fast-moving storage. Locate it close to the point of shipping and receiving.

Lighting. Good lighting is essential. Use what natural light you have by arranging shelving racks perpendicular to the windows. Usually, you'll also need artificial lighting. Call in an electrical contractor or consult your lighting department.

Obstructions. Don't try to "blend" your shelving into obstructions. Stop racks before, and start them after, columns, pipes, and other physical features.

Mechanical handling systems. If you're planning to use power conveyors to mechanize the handling of storage materials, think twice about designing the layout unassisted. Most conveyorized handling-storage systems need special engineering.

Storage design, inventory control, stock records, and stock finding are separate activities and should be treated accordingly in your planning. A stock-record system of the perpetual type is desirable for maintaining records of receipt and issue.

Make the shelf-coding simple and logical. Don't use a numerical sequence system based on part numbers. This may work out well for a short time. But usually part numbers change so often that shelves need continual rearranging. This is an added cost to avoid.

How do you estimate shelving costs?

Estimating the cost of shelving installation isn't as difficult as it appears. And with accurate estimates you can prepare a factual, comprehensive report to management on the need for your proposed storage system.

You base your estimates on the actual volume of materials stored. Try to work with standard-size shelving. Odd sizes really cost. Engineers of Alan Wood Steel Company's Penco Division (Oaks, Pa.), have prepared charts showing the cost per cubic foot of basic shelving units and cost per cubic foot of adding accessories. These costs are based on a standard quick-fastening shelving section measuring 36 x 18 inches x 7 feet 3 inches with seven openings. These costs will apply to most shelving installations.

How to use the tables—First, determine the full volume in cubic feet of the materials you intend to store. Then multiply this figure by the cost per cubic foot (see Table I opposite) to obtain the total cost of basic shelving units.

If your materials are classified as open-shelf storage materials, you already have your cost and need only know the number of sections you require. However, if your materials require different types of storage, such as bin, shelf, box, drawer, or divided shelf, then you must figure the cost of adding these accessories. This is done by multiplying the cubic-feet factor by the added cost per cubic foot (Table II).

Don't forget also to add the cost of freight, special colors, and labor in erecting the shelves. Even though bolted shelving on a knock-down basis costs about 7-10% (national average) less than quick-fastening shelving, erection costs run considerably higher. It has been fairly well estimated that the cost of erecting bolted shelving is $0.162 per cubic foot against $0.135 for quick-fastening shelving. Therefore, the cost advantage of single sections of bolted shelving is lessened somewhat by the increased labor cost as the number of shelving units required increases.

If you can use longer racks of quick-fastening shelving you will save money, because fewer uprights will be needed. To illustrate, a single section has four uprights while each additional section requires only two more uprights since two posts are common to both. Bolted shelving, however, requires four uprights per section.

The size of the order is also important. On orders up to 50 shelving sections, you can cut about 12% from your estimates; on 100 or more, about 20%; on 250 or more you may save 25%. These lower costs result from savings in material, and do not affect labor costs.

TABLE I. COST FACTORS FOR BASIC SHELVING UNITS

Description	Number of sections	Cubic feet of storage space	Square feet of floor space per cubic foot of storage volume	Cost per cubic foot
Open shelving 36″ x 18″ x 7′ 3″	4	126	.14/cu. ft.	$0.85
Closed shelving 36″ x 18″ x 7′ 3″	4	126	.14/cu. ft.	1.09
Open ledge shelving 36″ x 18″ x 7′ 3″ (12″ ledge section)	4	162	.54/cu. ft.	0.97
Closed ledge shelving 36″ x18″ x 7′ 3″ (12″ ledge section)	4	162	.54/cu. ft.	1.21
Counters (36″ x 24″ x 39″)	4	18	.333/cu. ft.	1.76

Note: *Costs are based on a unit of four adjustable shelving sections with common uprights. Single sections cost slightly more.

TABLE II. COST FACTORS FOR ADDING SHELVING ACCESSORIES

Accessory	Description	Added cost per cubic foot	Computing basis (cubic feet of section)
*Doors (2)	Closed shelving	$0.67	31.5
*Doors (4)	Closed ledge shelving	0.75	40.5
Dividers	12″ x 18″	0.018	31.5
Label holders	36″ wide	0.006	31.5
Bin fronts	36″ x 4″	0.029	31.5
Base closures	Front only	0.024	31.5
Shelf boxes (6-in. opening)	5½″ x 17½ x 4⅝″ (6 per shelf)	4.45	31.5
Drawer cases:	18-drawer 24-drawer	6.45 7.55	31.5 31.5

How to figure. *For doors, added cost per cubic foot x cubic feet of storage = cost of adding doors to a basic shelving unit.

For other accessories, calculate: number needed x added cost per cubic foot x cubic feet of storage space = cost of adding accessories to shelving unit.

Two examples: (1) Two doors are required on one 31.5-cu.-ft. shelving section. Thus, $0.67 x 31.5 = $21.10 added to basic cost.

(2) In a seven-shelf section containing 31.5 cubic feet, 21 openings are needed, requiring 14 dividers. Thus, 14x$0.018x31.5 = $7.90 added to basic cost.

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STEEL SHELVING

He runs

"WHAT RECESSION? According to these figures, '61 looks better than last year—which was excellent." Mauricio Galindo (right) projects current sales figures for visiting editor Norman Solon.

With foreign competition an ever-increasing factor in American business, FACTORY looks at industrial operations below the border. FACTORY's Norman Solon visited several Mexican plant managers to get an insight into their problems—how they differ from those of their American counterparts. And Mexican industry does differ. Its concept is vastly more paternalistic, middle management has not developed, governmental labor regulations are rigid—but so is tariff protection. One thing is certain. Mexican industry is growing—and fast. It's a force to reckon with.

"American suppliers are pricing themselves right out of the machinery market in Mexico."

"Foreign competition isn't hurting Mexico. Realistic tariffs protect our industries."

By **NORMAN H. SOLON**
Associate Editor, FACTORY

"We can't ship finished goods to the States as yet, but we are now exporting parts."

"Let's get that trouble cleared up muy pronto. I've got a golf date this Saturday."

a plant in Mexico

. . . and he's your counterpart, Mr. Plant Manager. But he most likely has a much greater degree of direct responsibility than you have. Delegation of authority is not a feature of foreign business.

Mauricio Ruiz Galindo manages D. M. Nacional S.A., Mexico City, a diversified large metalworking plant—749 employees—with office equipment as its main product. It's part of his father's industrial empire. This is typical. Most plants controlled by Mexican nationals are actively run by the owners. Industrial management is too often closed as a career field. It's something you usually buy or are born into. It's much the same situation that so often existed in the U. S. around the turn of the century.

Galindo himself is young—still in his twenties. Although he doesn't have a degree, he attended Monterrey Tech in Mexico studying business administration. He's married with two children, a golfer rather than a hunter or fisherman, and considered in the upper strata of Mexican society. He's articulate in both Spanish and English. Extremely nationalistic, he's at the same time class-conscious. He's young, ambitious, and capable. He's your competition. Here's Mexican industry as seen through his eyes.

Has the U. S. recession hurt your business?

Not to date. Based on early reports, 1961 looks even better than last year, which was excellent. A prolonged slump in the U. S. could hurt us badly, but I don't think that will happen.

Is foreign competition affecting you?

No. Mexican tariff laws have discouraged most foreign manufacturers of finished goods from invading our market. However, we feel these laws help rather than hurt other industrial nations. They have built up our industry. Now there's more profit in exporting equipment and machinery to us than in selling consumer goods to an underdeveloped economy.

We ourselves are running into the same situation in Central America, especially in Guatemala. We used to ship plenty of finished goods there. But now those countries are slapping on heavy tariffs to protect their own fledgling industries.

Speaking of machinery, are you buying U. S. models?

Up to the last few years the U. S. was our lone supplier. But you people are pricing yourselves right out of the picture. European suppliers are asking 30% less than their American counterparts for heavy machinery of comparable quality.

Of course, U. S. deliveries take only 45 to 90 days, against eight months to a year for German and English orders. But, except for emergencies, price talks.

Are you shipping goods to the States?

Not finished goods at present. Your tariff restrictions are too high to allow us to compete profitably. But we have made some test shipments of parts, which we can sell at competitive prices.

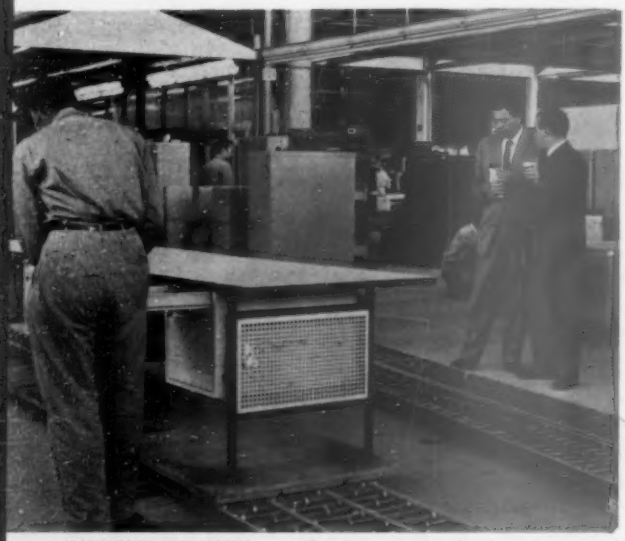
There's much talk about depressed wage scales and working conditions in plants outside the U. S. What is the labor situation at your plant?

Of course, our salary scales are considerably lower than yours. But so is our cost of living. As far as working conditions and fringe benefits are concerned, they'll compare favorably with any industrial plant in your country. Our present union contract calls for base salaries ranging from 2105 to 4280 pesos a month (roughly $175 to $356). However, our workers average 10 to 12% above these figures through our incentive plan. (Nacional employees are represented by a local union unaffiliated with a central organization.) Most of the industrial plants throughout Mexico have now become unionized.

We have recently cut our work week from six to five days and from 48 to 40 hours. (Mexican law requires

"THERE'S NO SHORTAGE of quality machinery at our plant. But our lower direct-labor costs and diversified operations just do not warrant large capital expenditures for automation."

"I DON'T WANT ANY EXCUSES. You're the supervisor and it's your responsibility to see that maintenance inspection and repair schedules are followed to the letter, no-matter-what."



"ALL OUR PRODUCTS get a final inspection check at the end of our assembly line. At other points supervisors are responsible for quality, and can halt production if it's not up to snuff."

"INCENTIVES are a relatively new phenomenon in Mexican industry. But we find them effective. Most workers average 10 to 12% over base pay. We post their daily earnings here."

"SKILLED CRAFTSMEN are at a premium in Mexico, therefore we stress training. This free mechanics' school for employees' children who are in the 14-to-15-age bracket is an example.

"YES, THIS IS the employee cafeteria. All our workers get free, hot lunches, complete with table cloths and waiter service for coffee. We even have our own bakery on the premises."

a 48-hour-week maximum.) The five-day week is making inroads, but it still isn't general throughout Mexico.

Governmental regulations regarding fringe benefits—such as medical and even maternal care—would be called pretty radical in your country. But our program is far more extensive than the law requires. It includes:

- Lunches for all workers. The cafeteria (photo) provides table cloths and waiter service for coffee.
- Transportation to and from the plant.
- Mechanics' school for children of employees (photo). It's for boys 14-15 years of age on a volunteer basis. They are under no obligation to remain with the company when they reach the legal age of 16. Many do, of course. And it's an excellent way of training workers in an area where skilled craftsmen are scarce.
- Medical service. If a worker calls in sick, he's visited at home by a company doctor.
- Housing on plant grounds. Now 30 families live there. They're picked by seniority and work record.
- Engineering scholarships given annually to children of our employees.

We're planning to institute a retirement plan in the near future, but that's not a pressing problem. The average age of our workers is only 26 years.

Are incentive plans prevalent in Mexico?

Not generally. We had a consulting firm in Mexico City set up time standards for us. It's working fine. Unlike many American plants, we post daily earnings of each worker on the bulletin board of the locker room. The slacker is not protected by anonymity.

Do you hire your foremen from the outside?

No. All our foremen come up through the ranks. And there's a definite line of advancement. First, a worker serves a six-month period of apprenticeship, usually started at the age of 16. After that he is given the regular status of a helper. He then advances, according to ability, from third- to second- to first-class officer, then to Class "A" officer which corresponds to assistant foreman, and finally to foreman. There are 30 to 40 workers assigned to each foreman.

To what extent have you automated your operation?

We've mechanized our painting line and certain other operations. But the potential of automation is limited. In the States you automate mainly to cut high labor costs. Our direct-labor costs aren't high enough to warrant heavy spending for automated equipment. We'll mechanize for product quality purposes only.

How is your maintenance department set up?

There's a maintenance department supervisor who shares the responsibility with a part-time outside engineering consultant. The department head reports to the plant superintendent who in turn reports directly to me.

Costs are pinpointed in a monthly report. There are also monthly downtime reports listing the time each machine is out and why.

Heavy stress is put on preventive maintenance. Inspection and repair schedules are tightly followed. This is especially true with regard to lubrication and electrical equipment. It's one of the reasons why outages have never been a serious problem with us. Housekeeping, by the way, is completely divorced from maintenance. Our 10-man janitorial force, which cleans the 110,000-sq.-ft. plant, reports to a house director. They start work a half hour before and leave a half hour later than production workers.

How about quality control?

Each supervisor is responsible for quality control in his department. He can, of course, delegate that function to his subordinates. Subassembly parts are usually checked on a sample basis. Time-keepers under our incentive plan also check for quality, but only the supervisor has the authority to stop production.

Have you a safety program?

Safety is a joint union-company responsibility. Each foreman, of course, is responsible for seeing that safety rules are followed. The union has a safety committee that meets once a month for discussion. At least one member of each department is a member of the committee. It's his responsibility to report any violations or accident hazards to the foreman.

Have you an employee suggestion system?

We instituted an award system some time ago, but from our standpoint it was a complete flop. (*Editor's note: Despite the lack of an efficient middle-management, Mexican plant managers interviewed tend to shun any personal contact with blue-collar workers on the floor. They deal with supervisors and occasionally with foremen, but they keep their distance from the men on the machines. Class consciousness is there.*)

What are some of your headaches?

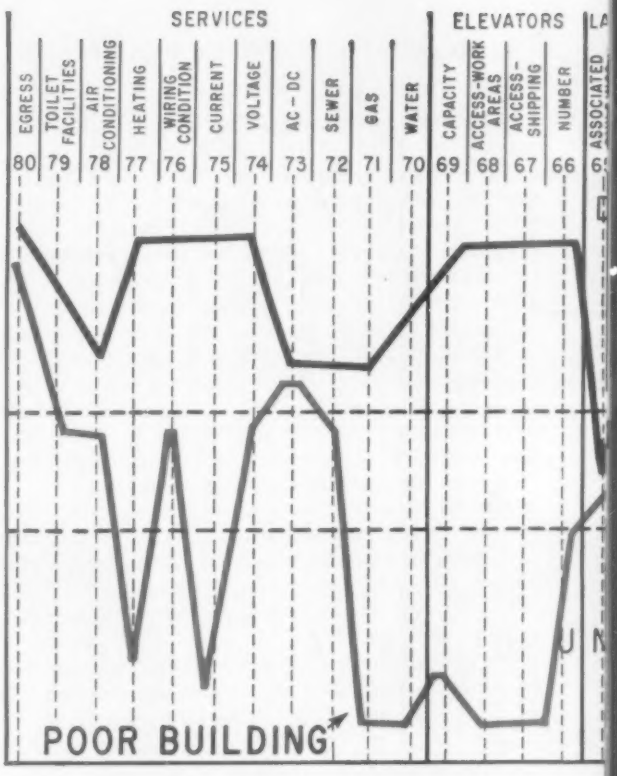
There's a definite shortage of skilled craftsmen and engineers. That's why we lay so much stress on training. An experienced engineer can demand a tremendous salary by our standards ($600 to $1200 a month).

In U. S. plants the problems end when you make a shipment. Not so with us. The sticky part is collecting bills. You can offer discounts for prompt payment till you're blue in the face and you'll still have a collection problem. (*Editor's note: Other large companies verified this observation. One executive of Bicardi y Cia, Mexico City, blamed the slowness of Mexican courts for this.*)

The government sometimes talks out of the left side of its mouth, and there's always the implied threat of interference or nationalization. But I'm inclined to discount it. If the government can run my plant better than I do, let it take over.

Building benefits at a glance

This easy-to-construct graphic tool compares dissimilar but related building factors. With it, you can size up existing buildings, make better decisions on rental questions, compare multi-plant operations.



Have you ever tried to list the good and bad points of your industrial buildings? And then attempted to put the results on paper in a clear and useful manner? Regardless of how detailed and definitive you tried to get, you probably ended up with a combination of tables and text that took time to explain and to read.

Now for the first time—as far as we know—here's a simple and quick graphic way to size up the physical attributes of a plant. It's called a "building utility profile." It was developed by Arthur D. Little, Inc., Consulting Engineers, Boston, as part of an industrial renewal survey conducted for the Philadelphia City Planning Commission.

One of the aims of the survey was to furnish an easily charted summary of thousands of industrial plants and to tabulate the collected data on punched cards. Even though not more than a handful of FACTORY readers might be interested in the data-processing aspects of the ADL survey, the visual chart development struck us as being one of the most useful tools we've seen in a long time for tackling the difficult task of evaluating plant buildings.

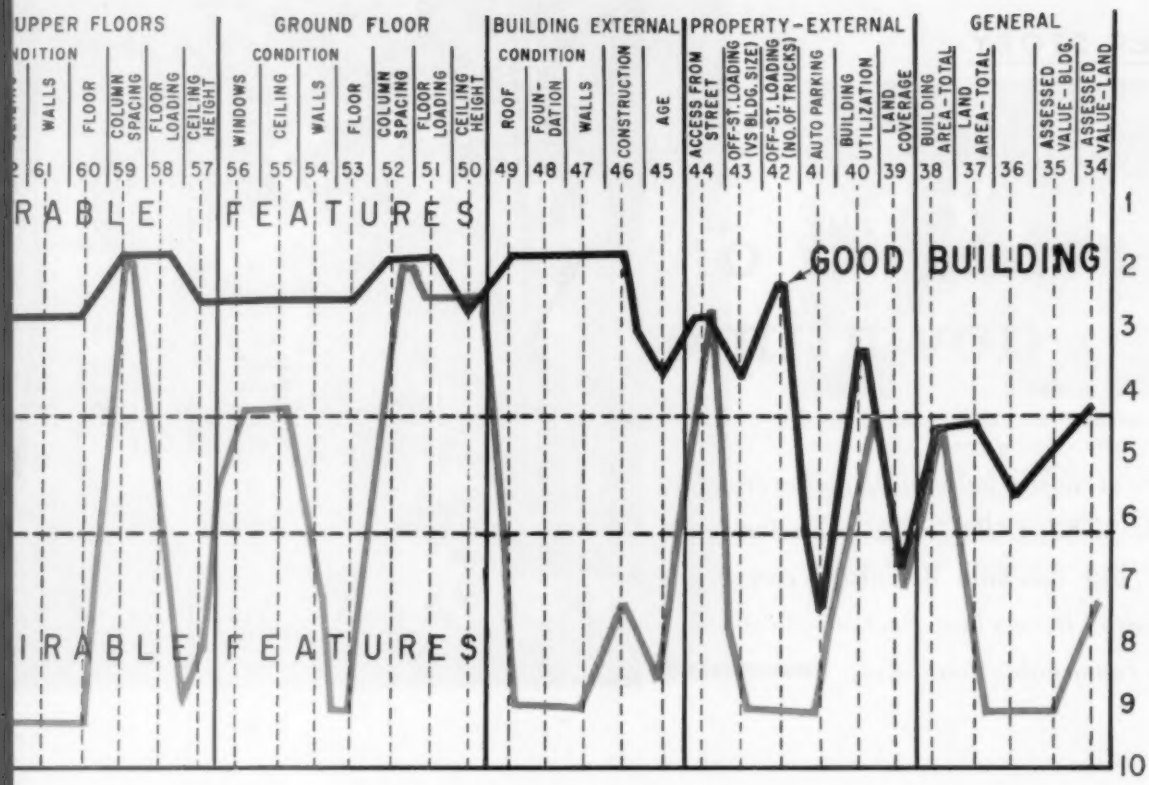
Skipping over—for the moment—the simple mechanics of setting up the chart, let's look at the basic principles and accomplishments of the building utility profile itself. Quickly and accurately, it gives a visual "profile" of a building—or of two or more buildings that are to be compared. Major categories—with subdivisions—read across the top of the chart from right to left. Arbitrary values for each subdivision are assigned vertically, starting with undesirable values at the bottom of the chart and working up to the most desirable values at the top. Simply by linking plotted points together, the data are transformed into a characteristic profile. Most charts wouldn't attempt to compare apples with oranges and peanuts, but this one presents easily such diverse items as amperes, windows, and bay sizes.

Heretofore it has been impossible to describe a building in simple terms such as good or bad if, for example, it has off-street parking but no freight elevator. The profile, on the other hand, makes it easy to evaluate the presence or absence of these two characteristics in relation to all the other desirable physical features.

Going back now to the method of making its survey, ADL used a survey form which has building characteristics arranged on a 10-point scale. The relative importance of each characteristic varies with the use of the building being surveyed. In the illustrated example, for instance, off-street parking and elevators would be weighted about equally. However, for an electronic manufacturer with many employees, parking would receive greater weight. Conversely, the existence of elevators would be weighted higher for a multi-story storage building, while off-street parking wouldn't be a serious consideration for the few employees concerned.

How can you use the technique of profiling your building utility? We can think of four main ways:

- Take a survey of your present building. A study of the good and bad points will indicate troublesome spots you may have been dimly



aware of, and which can now be pinpointed for corrective study.

• Compare—and contrast—several plants within a company. More than likely, the tell-tale peaks and valleys will flag some of the reasons for differences in productivity.

• Speed decisions when seeking to rent or buy a building. Comparison of profiles of potential "good buys" with a predetermined target profile can help greatly in the analysis as well as in communicating the conclusions to headquarters.

• Establish "desirable profiles" to help in the design-and-decision stage of new plant planning. Once the target profile has been established, any proposed departure for cost or any other reasons will stand out like a sore thumb. Its effects upon the whole can thus be carefully studied beforehand.

Now, what steps should you take to set up the building utility profile?

1. Determine the essential column headings.

2. For each heading, decide what standards you'll use when applying ratings. For instance, in your type of operations, 20x20-ft. bay sizes may be perfectly satisfactory and would rate high on the vertical scale. Any size under that would rate lower. Yet another industry might require far larger bay sizes, and on its scale a 20-ft. dimension would rate extremely low.

3. Prepare a work sheet as a combined guide and check-off sheet for your surveyor. Several typical items from the ADL work sheet are given below. This sets the boundaries for grading each item and allows a relatively inexperienced person to make the building survey. For instance, Item 39 (land area occupied by building), was arbitrarily allowed four possible ratings. The best, Value I, would be given when the building occupies less than 50% of the land area. The worst, Value 7, would be given when area occupancy is 90-100%. (In case you're wondering, Items 1 through 33 were used by ADL for factual data such as name, address, date, surveyor, etc.)

4. Prepare a reproducible master chart—if required—for logging the survey results.

		1	2	3	4	5	6	7	8	9	10
39	Area occupied by bldg. (%)	< 50		50-75	75-90			90-100			
40	Building utilization (%)		> 75		25-75				< 25	0	
41	Auto parking spaces	> 5		1-5				.5-1	< .5	0	
42	Off-street loading (trucks)	> 4	4	3	2		1			0	
44	Access from street		Good		Fair				Poor		
45	Age of building	< 15		15-30			30-50			> 50	
47	Condition of outside walls	Good		Fair						Poor	
50	1st floor ceiling height (ft.)		12-15		> 15				< 12		
52	1st floor bay area (ft.)	> 400	250-400	196-250					< 196		

COVER STORY

Zeroing in on zero downtime

Numerical control helps build rocket engines like this Thor-IRBM with precision and speed. But machine downtime can be a nightmare. Here's how Rocketdyne slashed it to a remarkably low level.

Rocket engines look deceivingly simple. Actually they are just the opposite. Components are extremely intricate in design. Machining accuracy is frequently to a few ten-thousandths. Materials used are typically among the hardest that can be machined at all. And designs are continually changing. In fact, a good share of rocket engine production is solely for experimental or development work. Criteria like these are sound reasons for a rocket engine manufacturer to install numerically controlled (N/C) tools.

It's not surprising then, that one of the nation's most important concentrations of numerically controlled machine tools is at the Rocketdyne Division of North American Aviation in Canoga Park, 25 miles northwest of Los Angeles. Here, in exurban surroundings near the company's engine test site in the Santa Susana mountains, Rocketdyne is building an impressive variety of liquid fuel rocket engines and components.

The urgent need for N/C tools didn't acutally show up until 1959. By early 1960, however, the movement was well under way with a half-dozen tools coming in, with more planned by the end of that year.

In the first few months of 1960, Rocketdyne had to cope with all the problems. Each of these was faced and solved without any serious hitches—thanks to good planning and topnotch managerial and engineering staffs.

Rocketdyne has set up to handle N/C maintenance and repair within a few months, starting from near-zero experience. This particular area is where many N/C-using plants have fallen flat on their faces.

Rocketdyne had an efficiently functioning electrical and maintenance staff, but no one who could be remotely considered an expert on N/C equipment. The Air Force was pressing for components that could only be produced in time on N/C tools. So the plant engineering and maintenance staff had to be right the first time. (Downtime on some N/C tools runs as high as $300 an hour.) Nor could they afford the luxury of keeping machine tool vendors' engineers on full-time duty waiting for something to go wrong. (On many missile contracts, competition is so keen there's a terrific squeeze on production costs.)

The proof of how well Rocketdyne succeeded in coping with probably the most complex kind of maintenance in industry is in its current downtime ratio. This is now averaging 8% and is expected to go down to 5% before long. This downtime score is remarkable when you consider that the plant is not air-conditioned; that ambient dust level and temperature are both high; that it is using some of the most complex N/C control systems in service today; and that no PM can be done during the two 10-hour production shifts, and—on some 24-hour-a-day N/C tools—it can be done only over weekends.

The speed with which the N/C tools are turning out finished parts still surprises the production department. Thanks to a highly competent staff, optimum machine programing has enabled Rocketdyne to capture a number of desirable production and development contracts, some of them for non-missile end uses. On one forging for the B-70 program, Rocketdyne, programing directly from the drawings, turned out a finished piece ahead of a competitor, who already had a template.

The essence of what Rocketdyne has learned in overcoming N/C maintenance woes and in constant improvement is in the five sections that follow. Some of the problems are peculiar to specific control systems. Some are being solved by improved controls or built-in trouble-shooting equipment. But any plant planning to invest in N/C equipment can learn from Rocketdyne's experiences.

Informal meetings keep Rocketdyne management posted on N/C progress. Discussing tape control are (from left) Howard Lesher, N/C maintenance staff specialist; Harry Monroe, general foreman of maintenance; V. L. Steffire, foreman of maintenance; Floyd Walters, general supt. of experimental manufacturing.

1. DON'T UNDERESTIMATE THE JOB AHEAD

Rocketdyne management went into large-scale N/C operation without any illusions that it would be easy. Seven different electronic systems were to be installed within a few months. Some had circuit check-out equipment, some did not; some had training and maintenance manuals, some did not. Some N/C vendors offered maintenance training schools, others did not.

Rocketdyne did have the benefit of the experience and advice of other N/C-using divisions of North American Aviation. It made visits to plants that had pioneered N/C tool usage. And, of course, it received considerable help from vendors. Here are some of the things it found:

• Some N/C tools had been installed for months, but had never turned out a usable part. Vendors' engineers frequently took months to debug equipment after it was theoretically "installed."

• Some of the corporation's other divisions that had N/C equipment were plagued with downtime approaching 50%. And their maintenance costs were sky-high.

• Some N/C users who relied on vendor maintenance contracts reported that factory technicians were no prize. Some were slow, others appeared to be inadequately trained. Information from the tool and control builders was poorly prepared and their own men were not always informed of design changes.

• In spite of toolmakers' good intentions, a California plant couldn't expect to get the same speed of service and parts delivery that a N/C user in the Midwest or East could. In spite of jet-plane speed, any complex breakdown seems to take one or more extra days on the West Coast.

• Many N/C users were in trouble because of incompetence and/or inflexibility of their maintenance staffs. In older plants, union and craft rules created a continual headache when men with highest seniority, but lacking ability or training, were performing unforgivable "experiments" on control circuits as they tried to diagnose trouble. Yet, in the same crews, men with the necessary competence frequently had to stand by as helpers while the malpractice went on.

After sizing up the problem, Rocketdyne management knew it was not safe to assume that N/C maintenance was "just another maintenance job" or that any initial difficulties would automatically straighten out in a month or two.

The choice then was how to staff a N/C maintenance operation that wouldn't raise labor relations problems, run costs out of sight, or force Rocketdyne to rely completely on N/C vendors. And the job had to be done

NUMERICALLY CONTROLLED MACHINE TOOLS AT ROCKETDYNE

1	Burgmaster 8-spindle drill	
1	Cincinnati horizontal mill	
1	Cincinnati vertical mill	
1	Probograph profiler	
2	Kearney and Trecker mills	
1	Milwaukee-Matic	
2	Sunstrand	
1*	Excello	
1*	Devlieg	
2*	Lucas Horizontal	* Units being installed.

Current Rocketdyne investment in N/C tools is $3-million. Eventually, it will be $5½-million.

in a few months while the first tools were being installed early in 1960.

The decisions? To set up a special N/C maintenance group open to anyone who could qualify for the training. To hire the best N/C maintenance staff specialist available, and have him in on the ground floor while plans for N/C technician selection and training were being set up. Dozens of men were interviewed, most of them with E.E. degrees. But Rocketdyne knew from the experience of other N/C users that diagnostic speed and teaching ability were more important than a degree. The staff specialist finally selected had not acquired an E.E. degree, but he had 15 years of electronic experience and training behind him. On hiring, he was immediately sent for several weeks of training at a key N/C vendor's plant. As soon as he returned, he began to assist in planning N/C technician training and facilities, while awaiting installation of the first machines.

Management backed up this staff with facilities and a budget adequate to buy or make whatever instrumentation was needed to cut downtime to a minimum.

2. PLAN ON CONSTANT RETRAINING

When the notices explaining how to qualify for specialized N/C maintenance went up on Rocketdyne's bulletin boards, 41 employees asked to take the tests. Prospects were told the tests would be tough, and that subsequent training would be demanding. Standards were set high right from the start. The N/C group was to be no haven for high-seniority workers without the capability or drive to keep ahead in a complex, fast-changing field.

The backgrounds of the 12 employees who qualified are interesting. Four were maintenance mechanics, one was a test equipment mechanic, four were senior industrial electricians, and three were engineering technicians. (Subsequent additions included two automotive mechanics and two office equipment repairmen.)

The men who passed the initial screening exam immediately began an accelerated training program on company time. During 1960, some 6000 man-hours of training were given the N/C group and the training program is still continuing. Four days a week technicians are given 1½ hours of classroom training. The program, worked out in cooperation with Rocketdyne's training section, was paced as fast as the men could handle the unit courses. All trainees must pass every exam. As might be expected, the men who have made greatest progress have been those who have been taking outside advanced courses in electronics. This is convenient in southern California—there are about 40 community colleges in the Los Angeles area alone, which offer a wide variety of such courses.

Men with greatest potential work the third shift, the only one on which PM is possible. They work on the idle machines, make adjustments, and run through checks that speed their understanding of the electronic and hydraulic circuitry.

Maintenance management at Rocketdyne estimates it will take about two years of concentrated work and training to make a qualified electronic or hydraulic man into a first-class N/C technician. It does not use vendor training because there are so many different systems. Conflicting opinions from different instructors might lead to confusion among the trainees.

3. GIVE PRODUCTION INSTANT HELP

You can't rate maintenance effectiveness solely in terms of technician competence or maintenance costs. Often a more important criteria is the way a maintenance department succeeds in keeping production satisfied. Rocketdyne management laid down one tough limit on the maintenance department very early in the game. No PM on first or second shift. Any repair time on these two shifts was considered downtime chargeable against the maintenance department.

Trouble phones are located right at the N/C tools. When a trouble call comes in, N/C technicians drop whatever they may be doing at the shop and go immediately to the faulty machine. On arrival, they go over in detail with the operator the sequence of events leading up to the trouble. The technician thus gets the benefit of any of the operator's observations. (Most of Rocketdyne's N/C operators are highly skilled workers.) And the operators see that maintenance is there to serve them as part of the same team, not as a competing department seeking a larger slice of the production budget or management approbation.

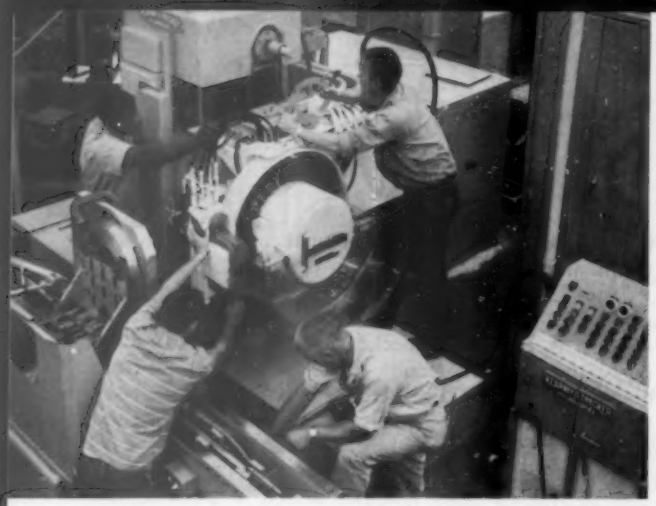
To save time, the most frequently needed spare parts (replacement tubes, relays, etc.), together with frequently used instruments, are stocked in maintenance department cabinets right on the N/C tool floor.

No matter what the emergency is, trouble shooting on N/C tools is done only by the highly trained N/C group. Other maintenance personnel, regardless of their competence in machine tool or electrical maintenance, are not allowed to work on N/C tools. The N/C group is on call for all shifts.

Another example of this two-way cooperation is the use of a continuous log at each tool. Operators record their observation of unusual operating conditions or off-normal performances. The daily log entry for an operator may vary from a sentence or two describing completely normal operation all through the shift to a lengthy series of observations leading up to a breakdown and its subsequent repair. The log is particularly helpful in alerting third-shift PM technicians of impending trouble.

Maintenance cost charges are carefully kept. Every maintenance charge shows machine number, whether it's for labor or material; and the benefiting department, whether the work was emergency or routine, the trouble electrical or mechanical. So both the maintenance and production departments know at all times what maintenance for each machine is costing.

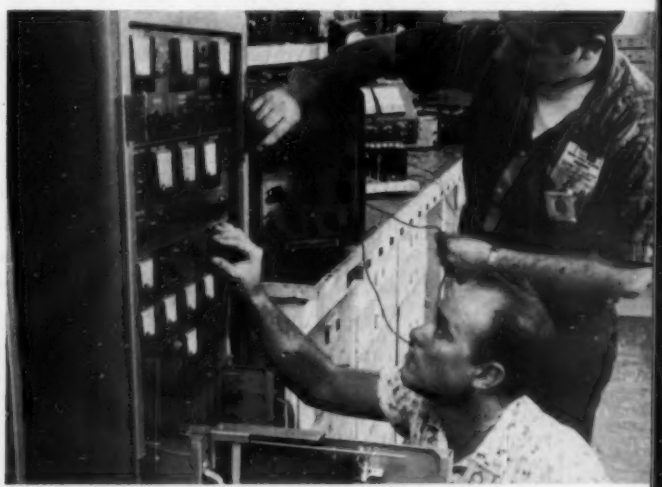
Turn the page



THIRD-SHIFT MECHANICS do all the preventive maintenance on Rocketdyne's N/C tools and control. Since this shift gives more opportunity to become familiar with the equipment, it's favored as the spot for the most advanced technicians.

TROUBLE PHONES are handy for N/C tool operators. Downtime on some tools costs as much as $300 an hour, so every minute counts. One phone in electronic maintenance is just for trouble calls. N/C specialists are sent out at once.

"BLACK BOXES" and unique plug-ins built by Rocketdyne have cut both PM and trouble-shooting time. In a few minutes, these units can run checks on the hundreds of relays in the Cincinnati milling machine control consoles (background).



WELL-EQUIPPED LAB cuts time spent in diagnosing troubles. Console (left) is used to check out important operating parameters on circuit drawer modules for Bendix N/C controls. Technicians have all the precision equipment they need.

HEADSET INTERCOM, plus plug-in test jacks, permit the balancing of d-c servo systems (like those used on this milling machine) to be done in five minutes. Before equipment was modified, the job (which is a frequent one) took 45 minutes.

HYDRAULIC STAND built by Rocketdyne to speed diagnosis in hydraulic systems is located on the production floor. Here mechanics check and balance a servo valve with the aid of a laboratory-built power source and a vibration-probe.

4. OVERCOME VENDOR SHORTCOMINGS

To the list of N/C maintenance problems it learned of through visits to other plants, Rocketdyne soon added some new ones of its own.

One of the toughest proved to be heat. Control-circuit designers hadn't provided for the 120-deg. summer environment of Canoga Park. Tubes inside the N/C control cabinets failed because the elements sagged under the heat. Increasing the cooling air simply traded one problem for another—dust. Control circuitry for the Cincinnati milling machines contains hundreds of telephone-type relays that will malfunction if dust or oil fumes collect on the contacts. There was no practical way to cut down atmospheric dust because windows and doors have to be kept open for comfort. After several months of frustration, Rocketdyne's plant engineering department installed air-conditioning units on all the troublesome controls, solving most of the dust, moisture, oil, and temperature problems simultaneously.

With strong management support, a topnotch N/C staff specialist, and eager servicemen, Rocketdyne has been in a position to do something about equipment design shortcomings. Hesitantly at first, but now with no reluctance, it redesigns circuitry or adds new features whenever they're needed. Vendors' repairmen haven't been in the plant for months.

One proof of success: Some of the improvements Rocketdyne developed have been picked up by N/C designers and incorporated into the latest controls. Here's an example:

In the machine servo panel of the E.M.I. (Cincinnati Milling Machine) system, three d-c amplifiers control large electro-hydraulic valves. Exact balance of these systems must be maintained at all times. Every time the plant temperature changes significantly, rebalancing is needed. When the systems were first installed, it took 45 minutes to balance the three servos in each machine. The control had to be turned off, the panels opened, and electronic test equipment connected. The balance potentiometers were relocated outside the electronic console and test jacks were installed. System balance time was reduced to five minutes.

Plans are currently underway to add a torque-sensing transducer to the main spindle on the Cincinnati milling machines. This will supervise a control circuit that will maintain cutting rate at any pre-set optimum point. This will speed up production without having to worry about overloading tools.

"Black-box" test equipment has enabled the staff to speed up both trouble shooting and PM testing. The maintenance staff builds the equipment, so they understand better how it works. Position-analog storage circuits involve hundreds of multiple-contact stepping switches and relays that had to be checked out one step at a time. No test equipment was available to speed the job, so Rocketdyne built a test unit that automatically energizes the switches and tests performance of every contact. The cost of the tester was insignificant once the design was worked out by the staff specialist. But it saves several hundred maintenance man-hours annually and does a better job.

Another trouble spot has been the N/C code converters. (There are 44 in each E.M.I. system, for instance.) A go/not-go checker was built up from spare parts, and converter trouble-shooting time was cut from hours to minutes. Altogether, five important "black-box" testers are currently in use, two are being built, and another two are being designed.

Rocketdyne makes no bones over its preference for control systems using modular design. If possible, the company would never put in another control using chassis-type construction.

Control drawings, as received from the manufacturers, have been unsatisfactory for fast trouble shooting. Rocketdyne found it could save enough critical time to justify redrawing them all. The new drawings are legible, use standard symbols, and are logically arranged, with interstage test points readily apparent. Even the latest N/C equipment still lacks good drawings, according to Rocketdyne. Lubrication charts have also been redrawn, so there will be no worry about inadequate lubrication when a new or substitute maintenance man takes over the job of servicing a N/C tool.

5. INSIST ON CONTINUOUS IMPROVEMENT

N/C maintenance isn't all glory. (There's nothing like a spurt of hydraulic fluid in your eye from a 5000-psi. system to remind you of that.) Yet Rocketdyne has to make the job interesting and remunerative enough to keep its best men from leaving for greener pastures. Staff morale and competence is kept high through continuous formal training, frequent conferences between electronic and mechanical technicians and encouragement of outside study.

The work can be frustrating, too. Here's a typical case: One team worked from noon to 9 p.m. trying to search out a faulty circuit. The trouble? Leads from a multi-axis control were removed and reversed by mistake when replaced. But the wire color code matched the vendor-supplied drawings, which were wrong. Occasionally, a hydraulic lead gets reversed in replacement and this can be very hard to diagnose. Mistakes like these usually occur because the men are thinking about the next checkout step while they replace connections in the circuit they have just tested. Where troubles are complex enough for this to happen, Rocketdyne has been working the men in teams, with one man checking another. To develop staff self-reliance, the staff N/C specialist doesn't come in on a trouble job until the men have been stuck for two or three hours.

The thorough system of record keeping is the biggest help of all in upgrading performance. Every trouble call or PM operation is recorded and the repairman's findings filed. Records are being analyzed constantly to see what troubles are recurring. If they're frequent enough, the answer may lie in a specially designed test device or in equipment modification.

SHARP NEW CONTROL SYSTEM MEASURES INDIRECT WORK, HELPS SLASH COSTS

Already working well at IBM-Poughkeepsie, where it was developed, the Performance Evaluation Program pinpoints the real costs of non-productive work in manufacturing operations.

From the early 1900s, as plant management has waged its dedicated battle against the direct costs of production, the other (indirect) costs of doing business have grown to staggering proportions. As a result, industry today finds its very foundation threatened by an excess of indirect costs.

IBM's Performance Evaluation Program (PEP) was designed to throw a rein on these costs—and it does. By insisting that plant operations be measured in terms of cost, productivity, delivery, and quality, PEP affords plant managers more effective control and a comprehensive method of communicating data "up-the-line." The system provides measurement data for virtually all plant departments not directly involved in production—quality control, plant engineering, production control, stores.

At the company's Poughkeepsie factory, PEP has enabled managers to:

- Determine degree and rate of change in indirect productivity and cost.
- Break down direct and support labor in non-manufacturing departments.
- Provide cost profiles on: units of output, scheduled vs. non-scheduled work, operations and jobs.
- Pinpoint areas most in need of methods improvement.
- Provide better plans for manpower and department expense requirements.
- Determine areas requiring more precise measuring techniques.
- Compare labor productivity vs. cost improvement in each department.
- Improve employee morale by eliminating subjective measurement.

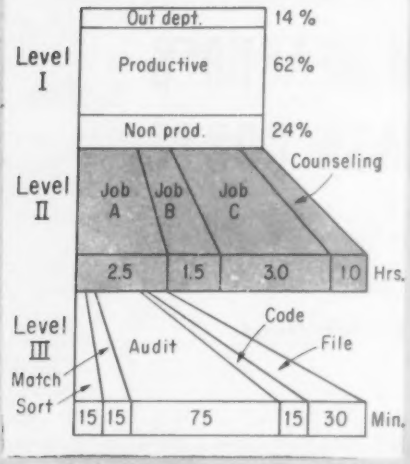
The story of PEP's development and a detailed explanation of how it can help your plant follows.

TURN THE PAGE

By **ARNOLD K. JONES**, Project Engineer, Performance Evaluation Program
International Business Machines Corporation, Poughkeepsie, N. Y.

Once you have completed and understood Form 1 (facing page), the rest of PEP falls into place.

Performance measurement methods



Activated in 1959, PEP is administered by IBM's Plant Industrial Engineering Department. We expect full coverage of personnel by the end of 1961.

In the development of PEP, four factors were considered paramount in evaluating a department's accomplishment of its functional responsibilities: *cost, productivity, deliveries, quality*. In departments where the work is of a direct nature (i.e., with a readily discernible and acceptable unit of measurement, such as parts stores), productivity and cost information is emphasized. In other departments, productivity and cost information is modified by additional evaluation of delivery and quality effectiveness.

In general, performance can be measured by three methods, or levels (see chart above):

Level 1, considered the broadest form of work measurement, determines the activity level (expressed as percentage of total work day) of a group or individual by a work sampling study.

Level 2 allows for a realistic productivity comparison from time period to time period. Through work sampling or employee self-reporting techniques, an activity breakdown is obtained. If, in addition to time recording, work counts are obtained, man-hour productivity can also be determined.

Level 3 provides for measurement by use of standards —developed either from predetermined methods-time data or historical data. With proper installation, scientifically based standards offer the advantage of a practical measure of efficiency.

Of the three methods, we selected Level 2. Reason: previous successful experience with employee self-reporting (e.g., in manufacturing operations by use of a labor claim card). A well-developed work sampling program, if you prefer it, can provide much the same results with regard to determining time distribution. With the Level 2 method fully developed, we plan to phase into Level 3 standards wherever practical.

To express results, we felt efficiency ratings would imply an absolute measurement of performance. Therefore, we established historical bases against which a department's accomplishments are compared. Final results are then expressed in terms of improvement indexes and net cost change.

Once the foundations of PEP were established, the plan was presented to the management of each indirect functional area by the assistant general manager and the applicable functional area manager. The department manager was told that PEP is simply a form of measurement and that the monthly results are subject to his individual judgment and action. He was then asked to list activities of his department and determine a unit of work for each. This started the program.

To study PEP in operation, let's follow it through application in a typical indirect operation—production control.

First, the department manager sets up a list of the activities for his group, plus productivity and cost evaluation criteria, as follows:

No.	Description	No.	Description
01	Order scheduled	03	Order cancelled
02	Order rescheduled	04	Order altered

Productivity	Cost	Productivity	Cost
Hours per 100	Per order scheduled	Hours per 100	Per order cancelled
Hours per 100	Per order rescheduled	Hours per 100	Per order altered

Next, since quality and delivery are also vital to production control, our manager sets up evaluation framework for these factors (see far right of Form 2).

Then, with the above framework as a guide, each employee daily records the number of hours he has spent in each listed activity. He indicates on a prepared form

FORM 1

A. TIME RECONCILIATION

1	15 (TOTAL PERSONS ASSIGNED EXCLUDING MANAGER) X 20 (WORK DAYS IN PERIOD) X 8 (HOURS IN DAY) = SCHEDULED HOURS	2,400
2	LESS: ABSENTEE, VACATION, ASSIGNED OUT = HOURS NOT WORKED	80
3	PLUS: OVERTIME, ASSIGNED IN = ADDITIONAL HOURS	125
4	TOTAL HOURS WORKED	2,445

B. DEPARTMENT EXPENSE RECONCILIATION

1	TOTAL HOURS WORKED	2,445	
2	AVERAGE LABOR COST PER HOUR	$ 2.50	
3	MULTIPLY LINE 1 BY LINE 2 [LABOR COST]	$	6,113
4	OTHER DEPARTMENT EXPENSE PER BUDGET STATEMENT		1,543
5	SUB-TOTAL		7,656
6	MINUS NON-APPLICABLE EXPENSE [SCHEDULE C]		30
7	SUB-TOTAL		7,626
8	PLUS OR MINUS BUDGET ADJUSTMENTS [SCHEDULE D]		153
9	TOTAL EXPENSE TO BE ACCOUNTED FOR		7,473

C. NON-APPLICABLE EXPENSE

	BUDGET ACCOUNT NO.	REASON FOR EXCLUSION	AMOUNT
1	300	YEARLY MACHINE MAINTENANCE CONTRACT	$ 30
4	TOTAL		$ 30

D. BUDGET ADJUSTMENTS

	BUDGET ACCOUNT NO.	REASON FOR ADJUSTMENT	AMOUNT
1	200	DEPT 901 SUPPLIES CHARGED TO DEPT 900 IN ERROR	153
4	TOTAL		153

E. NON-CHARGEABLE ACTIVITY [CODE 98]

ACTIVITY NAME	HOURS	ACTIVITY NAME	HOURS
FIRST AID	1		
COUNSELING	4		

F. MISCELLANEOUS ACTIVITY [CODE 99]

ACTIVITY NAME	HOURS	ACTIVITY NAME	HOURS
SPECIAL STUDY & REPORT	15		

STEP ONE in setting up PEP in your plant is to complete Form 1, above, and familiarize yourself with the factors involved. You'll use this information in later steps.

STEP TWO is the transfer of totals (hours, costs, etc.) from Form 1 to Form 2, below. Quality and delivery data are reported separately as in Section C, Form 2 (at right).

FORM 2

PERFORMANCE EVALUATION REPORT (NON-MFG. DEPTS)

A. GENERAL INFORMATION (FROM FORM 1)

1	TOTAL HOURS WORKED [SCHEDULE A LINE 4]	2,445
2	LABOR COST [SCHEDULE B LINE 3]	$ 6,113
3	TOTAL COST [SCHEDULE B LINE 9]	$ 7,473

B. DEPARTMENT ACTIVITIES (FROM EMPLOYEE REPORTS)

ACTIVITY NUMBER	DIRECT HOURS	SUPPORT HOURS	TOTAL HOURS	WORKCOUNT		ACTIVITY
01	2,100	140	2,240	3,160	SCHED.	
02	90	10	100	30	RESCHED.	
03	53	7	60	50	CANCEL.	
04	22	3	25	20	ALTER.	
88			5			
99			15			
TOTAL	(MUST AGREE WITH SCHEDULE A LINE 4)		2,445			

C. OTHER EVALUATION CRITERIA

		PERFORMANCE
DELIVERY	SHORT LIST-PERCENT PART NUMBERS ON SHORT LIST VS. TOTAL CONTROLLED	.12
DELIVERY	BACK ORDER-PERCENT OF PART NUMBERS ON BACK ORDER VS. TOTAL CONTROLLED	2.80
QUALITY	INVENTORY CONTROL-PERCENT OF INVENTORY DOLLARS OVER MAXIMUM LEVEL	4.20

The Performance Evaluation Report (right) emerges as the key to pinpointing areas for improvement in your plant.

whether this activity was directly applicable to the performance of his job (direct) or of a supporting nature (support). He also notes the work count of his direct production.

At the end of each month the department manager compiles the time, work output, and expenses of his department. He then completes two forms (Form 1 and 2, page 119) and submits them to the Performance Evaluation Group. He completes Form 1 first, then Form 2. Note that Form 1 considers not only real time worked (section A), but also time spent away from the job (sections E and F).

Actual department performance (as recorded in Form 2) is compared against a base period—usually taken from the previous year. If no previous base record is available, data are compiled for three months before PEP is applied. The historical base data for the production control department looked like this:

Activity performance indicator	Hours per 100 units	Unit cost	Other
01 Order scheduling	70.0	$2.25	
02 Order rescheduling	290.0	$10.00	
03 Order cancellation	104.0	$3.50	
04 Order alteration	120.0	$4.00	
Per cent of parts on short list vs. total controlled			.1
Per cent of parts on back order vs. total controlled			2.0
Per cent of inventory dollars over maximum level			5.0

The comparison of the department manager's evaluation report (Form 2) with the above historical base results in a department-wide progress report (Form 3, facing page). At IBM this is calculated through machine accounting. An explanation of these calculations is on the facing page.

The total figures at the bottom of Form 3 give the department manager a glance-level tool for making cost reduction decisions. These totals are explained as follows:

Productivity improvement index:

The total time saved divided by the total direct hours worked.

Time saved current month:

The product of work count multiplied by the remainder of the hours per hundred subtracted from the base (for each activity).

Direct labor coverage:

The percentage of total hours worked covered by the labor evaluation (i.e., direct hours).

Cost improvement index:

The total cost change divided by the total applicable expense expressed as a percentage.

Cost coverage:

The percentage of total hours worked covered by the cost evaluation—excluding non-chargeable hours (employee counseling, off-the-job-training, first aid, etc.) and miscellaneous hours (jobs generally of a non-recurring nature).

Cost change:

The difference between the current month and base period unit cost multiplied by current month and work count (quantity) for each activity, as recorded by the employees.

Quality and delivery evaluations, explained in Form 2, are shown separately on the bottom of Form 3. An explanation of how these results are calculated appears in the text underneath it.

Later each month, the various department reports are combined into project reports which, in turn, are consolidated into a functional area report. The report for the Production Control Area appears in Form 4 (facing page, bottom).

In the future, we hope to be able to weigh the four separate evaluation factors (cost, productivity, delivery, and quality) according to their importance, and come up with a single index of improvement.

SUMMING UP

The Performance Evaluation Program is a dynamic and ever-responsive addition to the needs of management. IBM Poughkeepsie is currently considering an expansion of the analysis to include the effects of both horizontal (i.e., other departments) and vertical (i.e., other plants) interactions upon the efficiency of an operating unit.

Warren K. Lind, assistant general manager of the Poughkeepsie plant, says this of PEP:

"We are continually looking for tools that will provide the manager with an exact knowledge of how he is managing. By serving the manager in this capacity, PEP helps build a management group equipped to meet the demands of the future."

FORM 3

PERFORMANCE EVALUATION REPORT

PRODUCTION CONTROL DEPARTMENT

ACTIVITY NUMBER	DIRECT HOURS	SUPPORT HOURS	TOTAL HOURS	APPLICABLE EXPENSE	WORKCOUNT	LABOR EVALUATION			COST EVALUATION			
						HOURS / 100	BASE	TIME CHANGE HOURS	UNIT COST	BASE	COST CHANGE	YEAR TO DATE COST CHANGE
01	2,100	140	2,240	$ 6,853	3,160	66.4	70.0	- 113.76	$ 2.17	$ 2.25	$ 253	$ - 546
02	90	10	100	306	30	300.0	290.0	+ 3.00	10.20	10.00	+ 6	+ 15
03	53	7	60	179	50	106.0	104.0	+ 1.00	3.58	3.50	+ 4	+ 7
04	22	3	25	75	20	110.0	120.0	- 2.00	3.75	4.00	- 5	- 9
98	–	–	5	15								
99	–	–	15	45				- 111.76				
TOTALS	2,265	160	2,445	$ 7,473							$ 248	$ - 533

PRODUCTIVITY IMPROVEMENT INDEX	TIME SAVED CURRENT MONTH	TIME SAVED YEAR TO DATE	PRODUCTIVITY IMPROVEMENT YEAR TO DATE	DIRECT LABOR COVERAGE	COST IMPROVEMENT INDEX	COST COVERAGE	COST CHANGE
4.9 %	111.76 HRS.	240.00 HRS.	5.0 %	92.6 %	3.3 %	99.2 %	$ - 248

STEP THREE. A quick glance at the result sections of Form 3 (above) pinpoints areas in need of improvement action. These results (their derivation is explained on the facing page) are mostly totals of the various performance changes as listed on the upper portion of Form 3. Therefore, it's vital that you know where these figures come from and how they are calculated.

The first thing to do to complete Form 3 is this: transfer to it from Forms 1 and 2 the required hour totals, expenses, and work counts for each department activity. Then make the following calculations:

To calculate time change in hours, subtract the current month's direct hours per hundred from the established base. Then multiply this by the work count (rounded to nearest 100th.)

For an example, take Activity No. 01. From its base, 70.0, you subtract the hours per 100 for the current month, 66.4. The result, 3.6, is then multiplied by the workcount, 3,160, rounded to the nearest 100th. The result gives you the time change of 113.76.

To calculate cost change, first subtract the unit cost from the established base. Then multiply the result by the work count.

To calculate unit cost, divide the work count into the activity expense. Results for Form 4 (area report, below) are calculated similarly.

FORM 4

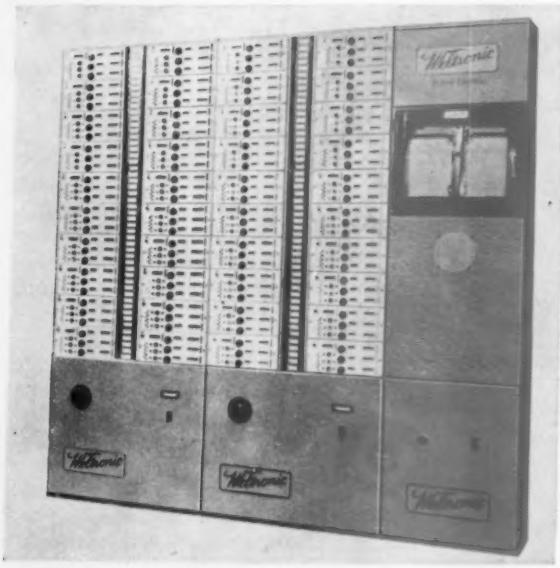
SUMMARY PROGRESS REPORT

PRODUCTION CONTROL AREA	FEB 1961

DEPT. NO.	GROSS HOURS WORKED	TOTAL EXPENSE	EVALUATED EFFORT			OTHER EFFORT		RATINGS						
			DIRECT HOURS	SUPPORT HOURS	TOTAL HOURS	UNEVALUATED HOURS	NON-CHARGEABLE HOURS	THIS MONTH			YEAR TO DATE		COST IMPROVEMENT	COST COVERAGE
								PRODUCTIVITY IMPROVEMENT	DIRECT LABOR SAVINGS	DIRECT LABOR COVERAGE	PRODUCTIVITY IMPROVEMENT	DIRECT LABOR SAVINGS		
900	2,445	$ 7,473	2,265	160	2,425	15	5	+ 4.9%	$ 279	92.6	+ 5.0%	$ 600	+ 3.3 %	99.2
901	4,060	12,424	3,600	400	4,000	60	0	+ 2.1%	189	88.7	+ 3.2%	576	+ 2.8 %	98.5
902	2,890	8,236	2,500	200	2,700	186	4	- 4.0%	(250)	86.5	- 3.8%	(475)	- 3.5 %	93.4
903	3,840	10,944	3,500	320	3,820	14	4	+ 6.2%	542	91.1	+ 4.9%	858	+ 7.0%	99.5
904	5,700	17,442	5,500	170	5,670	15	15	+ 1.3%	179	96.5	- 1.0%	(275)	+ 2.0 %	99.5
TOTALS	18,935	$ 56,519	17,365	1,250	18,615	290	30	+ 2.1%	$ 939	91.7	+ 1.4%	$ 1,284	+ 2.6 %	98.3

EQUIPMENT NEWS

For more data, circle item numbers on Reader Service Card next to back cover.

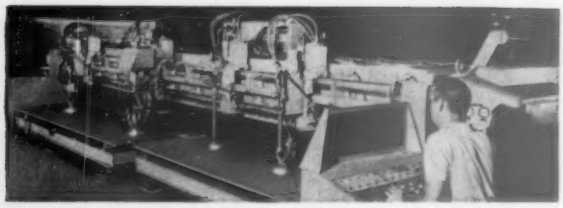


Monitors machine output

Production statistics always at your fingertips without moving from plant office. That's what "Plant Central" offers supervisors wanting to save time and shoe leather.

It consists of a master control panel with 20 subpanels (photo) each connected with respective control box on production machines. Operator dials condition of machine or type of help required, such as "production," "maintenance," etc. Then one of three colored indicators on control box blinks or lights, depending on condition. This is relayed automatically to master subpanel and indicators there flash to show the supervisor whether machine is on production, downtime, or set-up, and its exact condition.

Meters on master control are continuously recording time and quantity when on production, how long and how many times when on downtime or set-up, plus other data. Supervisor thus has continuing picture of changing production activities and control of every machine in plant. *Weltronic Co.* (Circle 88)



Numerical tape controls cutter

Bridge-type flame-cutting machine, guided by numerical tape, automatically cuts straight lines and contours in plate of any length, 22 ft. wide, 6 in., thick. Programed from engineering drawings; eliminates templates. Cutting speed from 2 to 35 in. per min. accurate to ± 1/64 in. *Air Reduction Co.* (Circle 89)

90—Miniature recorder measures, on paper tape, any variable (voltage, temperature, pressure, current) that can be converted to produce electrical signals. Portable or permanent installation. Inkless, smudgeless, unaffected by heat, cold, moisture, fumes. *Amprobe Instrument Corp.*

91—Nail remover pulls up to 800 nails per hour from salvable lumber without splintering wood. Boards to 2x4 in. are simply slid across machine's surface. Rapid toggle action closes jaws on nailheads, up to 5/16 in. in diameter, that project ¼ in. or more. *Scrap Processing Co.*

92—Gas-fired air heater is useful where noxious gases, acid fumes, dust, or hot vapors require frequent air changes. No combustion chamber—handles only non-circulating air. Seven models; air output, 11,000 to 60,000 cfm.; heat to 6,750,000 Btu./hr. *Dravo Corp.*

93—Polyethylene containers are molded seamless for extra strength and rigidity. Low cost, non-toxic, colorless, odorless. Handle corrosive materials such as hydrofluoric acid. In 11 sizes, rectangular or round, to 350 gal. *Apex-Reinforced Fibre-Glass Div.*

94—Speed reducer simplifies installation and interchange of any NEMA "D" flange. Involute helicoid thread worm gear offers maximum load carrying ability, high efficiency, quiet operation. For motors to 20 hp., 5:1 to 70:1 speed ratios. *DeLaval-Holroyd, Inc.*

95—16mm movie camera, silent or sound, can be monitored during filming through reflex viewer. Low-cost, compact unit is useful for training films, time and motion studies, etc. Interchangeable optional equipment includes 1200-ft. magazine. *Eastman Kodak Co.*

Turn the page

NEW AUTOMATIC® PALLET TRUCK WITH COMPACT PRICE AND SIZE

★ **MODEL RP**
Capacities 4000 and 6000 lbs.

★ **Works in as little as 52" intersecting aisles.**

★ **Simple, conveniently located, easy-to-operate controls.**

★ **Accepts 12 or 24 v. batteries.**

★ **Speeds up to 5.25 mph.**

★ **Spring-loaded casters increase stability, safety.**

★ **Interchangeable parts with other AUTOMATIC trucks. All parts easily accessible.**

We've re-engineered our pallet truck line . . . and you're the big winner. More functional design permits a lower price tag and gives you a better truck in the bargain. For example, the new Model RP uses a special caster system for greater cornering stability and safety. Casters at the two rear corners are spring-loaded to maintain constant contact with the floor. A rugged, one-piece frame concentrates the weight on traction and load-bearing wheels, enabling casters to pivot easily.

AUTOMATIC QUALITY THROUGHOUT

Model RP is equipped with the famous AUTOMATIC Class H silicone-insulated drive motor which is specially built for heavy-duty use and long life. A unique spring-applied, hydraulically-released brake gives long service without complicated linkage adjustment. The battery can be removed from either side or by overhead chain hoist. Extra room and operator comfort have been provided.

DOES THE WORK OF TWO WALKIES ON SOME JOBS. Compared to walkies, Model RP is twice as fast, twice as efficient for medium and long distance horizontal movement of pallets.

AUTOMATIC

A Division of The Yale & Towne Manufacturing Company
39 West 87th St., Dept. P1,
Chicago 20, Ill.

Send for literature

Please send specification sheets on new Model RP Pallet Truck.

Name_____ Title_____

Company_____

Street_____

City_____ Zone____ State_____

For more facts Circle 455 on Reader Service Card

For more data, circle item numbers on Reader Service Card next to back cover.

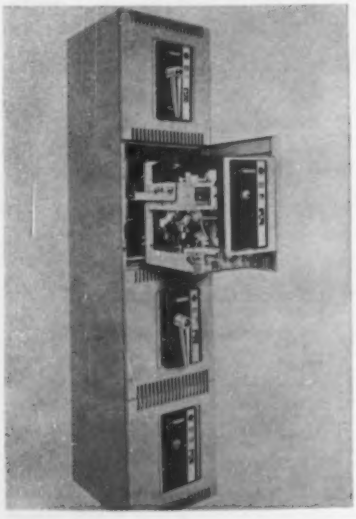
Runs like car, costs like scooter

Scoot around the plant to deliver messages or mail, or patrol by night with this lightweight 3-wheel vehicle. Speed is held to a safe 16 mph. and it travels over 50 miles on a gallon of gas. A single pedal controls the accelerator and brake. Pushing down with toes releases brake and allows accelerator to operate. To brake, rider presses down on heel section. When foot leaves pedal, brake sets automatically.

"Men-E-Uses" even lends itself to light hauling service with trailer attachment. Double compartment in handle holds record forms, pencils, rubber stamps, and stamping pads.

Scooter comes with 4-cycle, 3-hp. engine, single- or double-speed range. Smooth, gentle takeoff with automatic power transmission. Lever changes speeds. Total load capacity including rider is 200 lb. *Flinchbaugh Co.* (Circle 96)

Ratings go up, prices stay the same



Circuit breaker line with new high continuous ratings costs no more than previous lower-rated models. Two series of 600 v. a-c units: Three frame sizes, 400-, 800-, and 2000-amp., and 50,000-amp. interrupting current; and two frame sizes 3000- and 4000-amp., and 100,000-amp. interrupting current.

Simplified stored-energy mechanism has few parts. Front-mounted timing device permits changes in trip setting with breaker in connected position. Only nine series trip coils cover entire interrupting range. Four-high stacking of 2000-amp. breaker in 90-in. cell. Easy check-up or maintenance with telescoping roll-out carriage. *Federal Pacific Electric Co.* (Circle 97)

98—Rotary transducer converts mechanical motion into digital voltage pulses to provide numerical readout. Monitors automatic control functions in batching or continuous process operation. Measures lengths to 1/1000-in. speeds to 1/100 rpm. *Louis Allis Co.*

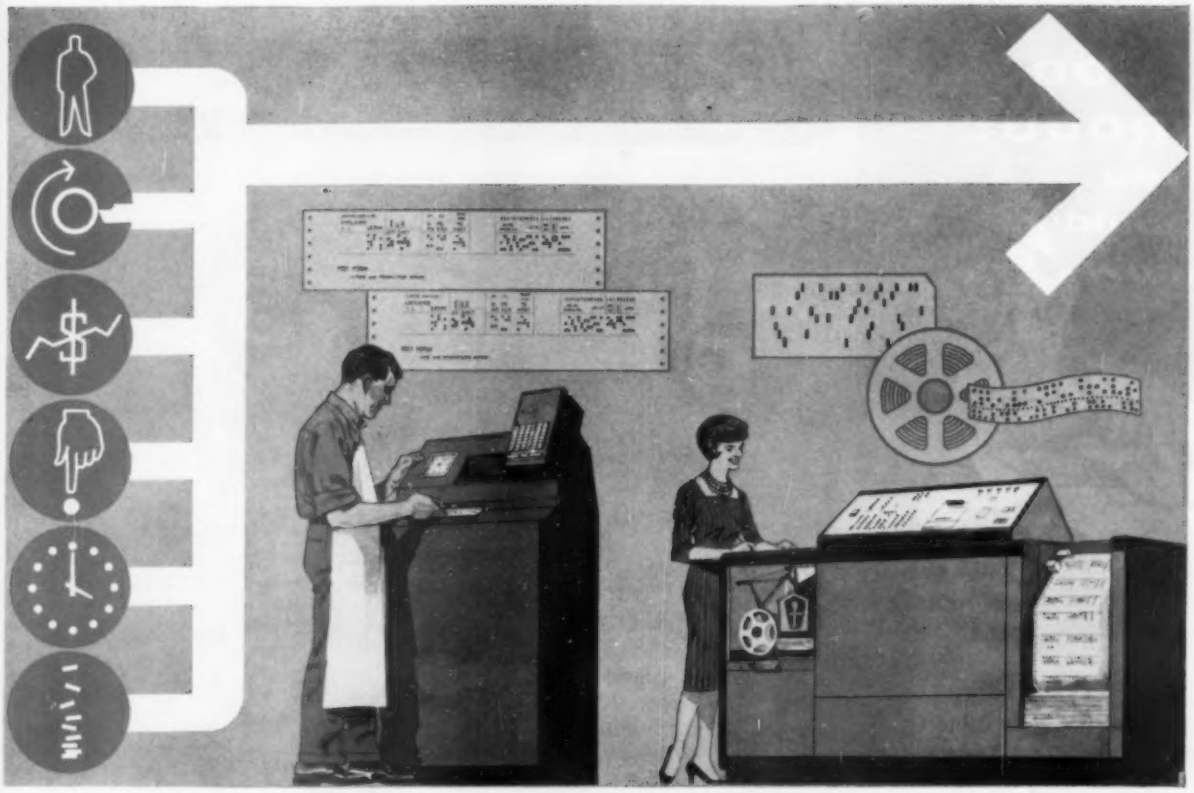
99—Steel disk wheels, with 6- or 8-in. replaceable polyurethane tires, handle 500- and 700-lb. loads, respectively. Low friction coefficient allows wheels to roll easily under heavy loads. Resilient tire won't damage floors; is corrosion-resistant. *Jarvis & Jarvis Div.*

100—Portable a-c generator, 1 to 5 kw., is useful where power lines don't reach, and for standby installations. Voltage regulation is within 10%. Small models have carrying handle; larger, handle bars; and largest moves with dolly. Gas-powered; rugged. *Tait Mfg. Co.*

101—Portable two-way FM radio has microphone and speaker built into 9x5x2-in. case just over 3 lb. Operates in 132-174 mc. bands with one watt RF output. Compatible with two-way car radios and pocket receivers. External mike, speakers optional. *General Electric Co.*

102—Automatic voltage regulator, 240 and 480 kva., is for heavy duty application requiring constant output voltage with zero waveform distortion. Adjustable output from 440 to 480 v. Up to 99% efficient, with 0.28-sec.-per-volt correction rate. *Superior Electric Co.*

Turn the page



STANDARD REGISTER
STANOMATIC SYSTEM

Now... completely automatic source data handling... factory floor to final reports

The big news in automatic data acquisition ahead of data processing is Standard Register's revolutionary Stanomatic System.

Now, instead of the usual manual methods of recording information pertaining to labor distribution and production control, it is possible to gather and record it mechanically for conversion to punched tape, magnetic tape or punched cards for subsequent machine accounting.

Starting point is the original event (circles in above chart) concerning — man, operation, order, variable data, time and production.

The information required about each event is recorded on the Stanrecorder by means of embossed plates, punched cards, time clock and keyboard. The Stanrecorder automatically prints in both man-readable and machine-readable language on a 2-part continuous form.

A copy of this coded form is next fed into the Stanomatic Reader-Translator which prepares the data for machine processing. (In companies with relatively small production volume, this job can be accomplished by manual key-punching of tabulating cards using the form prepared in the Stanrecorder as the source document.)

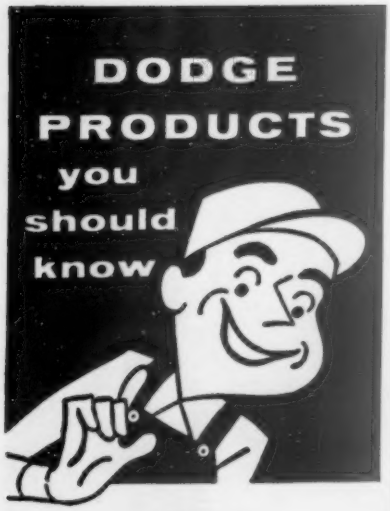
Source data pertaining to labor distribution and production control are automatically accumulated for fast, accurate, complete processing. But going farther, the Stanomatic System provides bonus advantages. The worker can have his own copy of each transaction he records. A complete, permanent chronological audit trail is provided by which every transaction can be quickly reconstructed. And management receives faster, more accurate, more comprehensive reports.

Test the Stanomatic System at low cost on your own factory floor. Write, wire or telephone for details of Standard's Feasibility Package.

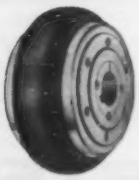
Business Forms and Forms Handling Equipment for Paperwork Simplification

THE STANDARD REGISTER COMPANY, DAYTON 1, OHIO

For more facts Circle 456 on Reader Service Card



FLEXIDYNE
The Dry Fluid Drive
New soft starts . . . overload protection.



DODGE FARA-FLEX
The Flexible Cushion Coupling
with the 4-way flex!

ROLLING GRIP
FRICTION CLUTCHES
Positive! Smooth! No Toggles!

•

Write for Bulletins!

- ✓ Flexidyne Drives & Couplings.
- ✓ Para-flex Couplings—data.
- ✓ Rolling Grip Clutches—data.

DODGE MANUFACTURING CORPORATION
400 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

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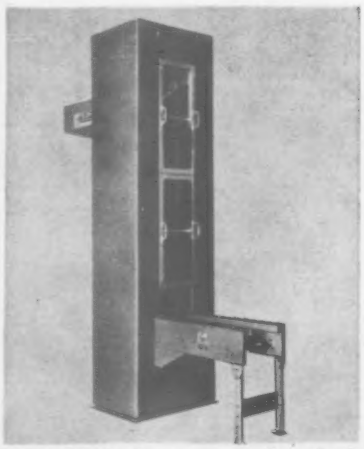
EQUIPMENT NEWS

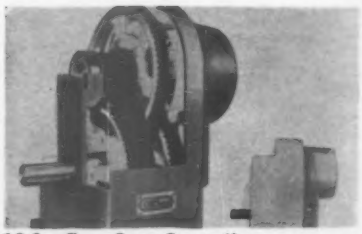
For more data, circle item numbers on Reader Service Card next to back cover.



103—Vertical conveyor, for single or multi-story operations, is continuous self-loading and unloading unit. Automatically moves from 14 to 30 cases per min. up or down on chain-mounted flights. Vertimatic adapts to existing systems. *FMC Materials Handling Systems.*

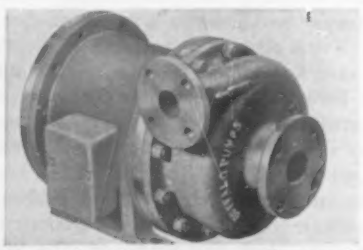
104—Portable radio control permits operation of unmanned diesel locomotive from remote position. Releases brakes, starts it in either direction, controls acceleration precisely, allows it to coast, and applies brakes. Also sounds whistle, bell. *Union Switch & Signal Div.*

105—Data processing system, for small and medium-sized plants, eliminates multi-machine, multi-operator accounting systems. Consists of desk-size computer with 10-total typewriter accounting machine. Requires just few hours of programer training to use. *Burroughs Corp.*



106—Speed reducer/increaser resists te nperature changes from —60 to +200 F. Takes up to 40% less space and is half the weight of current models. Mounts at all angles. Housing can be hosed down. In ½ to 2 hp., 16½ to 780 rpm. Drive unit uses no oil. *Machine Control.*

107—Electrofile pops up right data card at touch of keyboard. Ends refiling—cards can be put back at random anywhere in file. Handles thousands of cards; fast coding by name, number, class, or specific fact. Saves filing time, prevents errors. *Acme Visible Records, Inc.*



108—Centrifugal pump is totally enclosed and hermetically sealed for use with toxic, flammable, or volatile liquids. Long-life, self-adjusting bearing eliminates mechanical seals, stuffing boxes. In 13 sizes, for 120 psig. at 40 to 250 F., 1 to 5 in. discharge. *Buffalo Forge Co.*

Turn the page

The Seal Won't Blow!

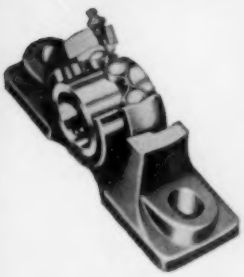
These pillow blocks are equipped with metal backed synthetic seals that are locked into position. They can't blow out when the bearing is lubricated with a grease gun. And dust and dirt can't get in.

Because these bearings are assembled, lubricated and sealed at the factory they go onto the shaft in perfect condition. And they *continue* to operate with the fine precision built into them—unaffected by external conditions.

Thousands of users know this from experience—users who depend upon these bearings for high quality anti-friction service at very moderate cost.

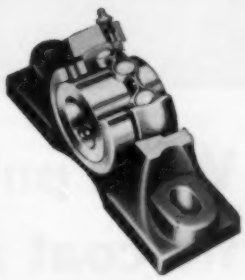
The Dodge SC and SCM line includes not only pillow blocks, but flange bearings, cylindrical units, hanger bearings and screw conveyor hanger bearings. Ask your Dodge Distributor—or write us for complete technical bulletin.

Dodge Manufacturing Corporation, 400 Union Street, Mishawaka, Indiana



DODGE SC
FOR NORMAL DUTY

Rugged one-piece semisteel housing, deep groove ball bearing, long inner race, fully self-aligning. ½" to 2 7/16".



DODGE SCM
FOR MEDIUM DUTY

Even heavier housing than in SC, deep groove ball bearing, long inner race, fully self-aligning. 1 7/16" to 3½".

The Products with the Pluses...

DODGE

of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge he can give you valuable assistance on new cost-saving methods.

What put out the flo-coat and drier fire?

For fires in flo-coaters, driers, quench tanks, dip tanks, storage rooms . . . nothing beats a Kidde fully automatic carbon dioxide fire extinguishing system. U.L. and F.M.-approved Kidde systems go into action at the first sign of a blaze, snuff out fire in seconds, leave no mess to clean up later. Protect yourself by protecting volatile solvents, gases, flammable liquids—*all hazards*—with an automatic Kidde system. Kidde's 40 years' experience can help you guard any fire hazard. Write today and find out how.

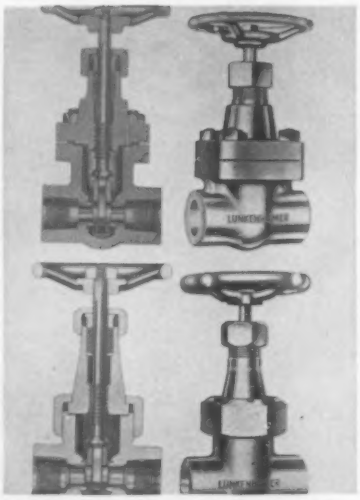
Kidde

Industrial and Marine Division
Walter Kidde & Company, Inc.
932 Main St., Belleville 9, N. J.
Walter Kidde & Company of Canada Ltd.
Montreal — Toronto — Vancouver

Begins on page 122

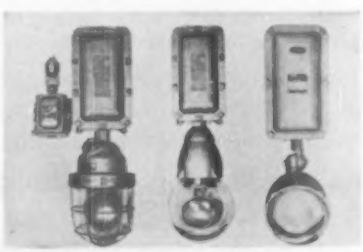
EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.



109—Gate valve, with screwed or socket ends, is compact for fast installation in limited space. Available with bolted bonnet (top, photo) in 1½- and 2-in. sizes, or union bonnet (bottom) in ¼ to 1 in. Can be repacked under pressure when valve is open. *Lunkenheimer Co.*

110—3-D adapter kit converts closed-circuit TV into three-dimensional viewing in minutes. Consists of lens system to produce split-image TV picture, replacement stereo screen for monitor, stereo glasses or hood. Needs no electronic modification. *Stereotronics Corp.*

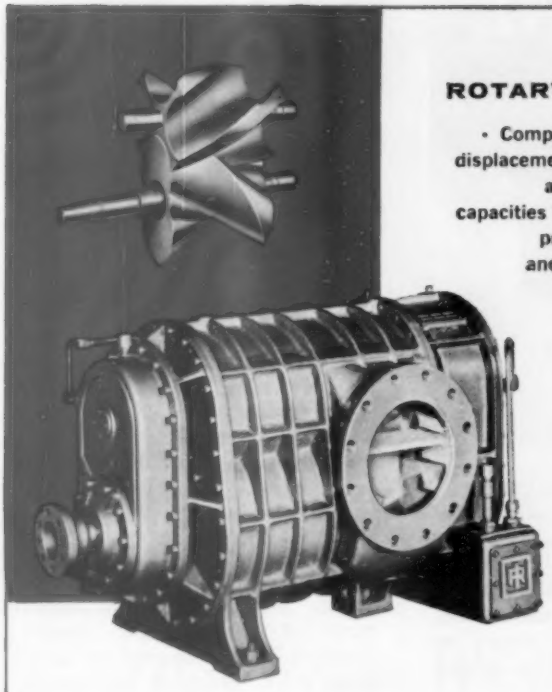


111—Emergency lights for hazardous areas are explosion-proof, dust- and vapor-tight in sealed aluminum housing. Self-contained dry battery pack—no need for remote power supply. Activate instantly when line current fails. Operate for over 5 hours. *Carpenter Mfg. Co.*

Turn the page

...Now there are 2 TYPES / 45 SIZES of

Axi-compressors



ROTARY COMPRESSORS

• Compact, space-saving positive-displacement axial-flow Axi-compressors are now available for capacities from 100 cfm to 18,000 cfm, pressures to 250 psig and vaccums as required

Type L single-stage low-pressure units, with side suction and discharge, cover pressures to 15 psig or vacuums to 22" Hg, in capacities from 100 to 12,000 cfm. Two-stage units can be supplied for higher pressures and vacuums.

Type H high-pressure units, with bottom suction and top discharge, provide compression ratios up to 4.5 per stage and are designed for a maximum discharge pressure of 250 psig.

Ingersoll-Rand.

11 Broadway, New York 4, N.Y.

THE WORLD'S MOST COMPREHENSIVE COMPRESSOR EXPERIENCE

Now, with *two* Axi-compressor designs to choose from, you can meet a wider range of pressure and vacuum requirements than ever before.

Both types offer the time-tested Axi-compressor advantages of small size, light weight, high efficiency, oil-free compression, freedom from pulsations or vibration and exceptionally low maintenance. The two meshing helical rotors are the only moving parts. They do not touch each other or the casing – hence there is no metal-to-metal contact, no lubrication is required in the compression chamber, and rotors are not subject to mechanical wear.

Ask your Ingersoll-Rand engineer for the complete Axi-compressor story. Or send for Bulletin 11003 on Type L units or Bulletin 11015 on Type H units.

WEDGMOUNT LEVELING MACHINERY MOUNTS

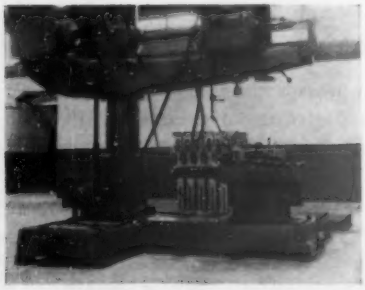
You can now effectively dampen and isolate the vibration, shock and noise of any machine with Wedgmount machinery mounts.

Wedgmounts are manufactured in a wide range of sizes and capacities so that it is possible to control the vibration of any type of machine tool — from punch press to grinder.

Wedgmounts are installed without bolts or cement and installation takes but a matter of minutes. Because of their opposing wedge construction, Wedgmounts are easily leveled by means of an adjusting bolt — no need for shimming.

Other models, retaining the leveling feature, are available to use where bolting to the floor is mandatory, or where it is desired to make the mount an integral part of the machine.

Write for full information about Wedgmount leveling machinery mounts.



* The photograph above is from an actual Wedgmount installation. It is one of eight 4" x 8" Type S Wedgmounts supporting a Cincinnati-Bickford 6 foot radial drill, shown at left.

Air-Loc® DIVISION

Clark, Cutler, McDermott Co.

105 WEST CENTRAL ST. • FRANKLIN, MASS.

For more facts Circle 461 on Reader Service Card

Begins on page 122

EQUIPMENT NEWS

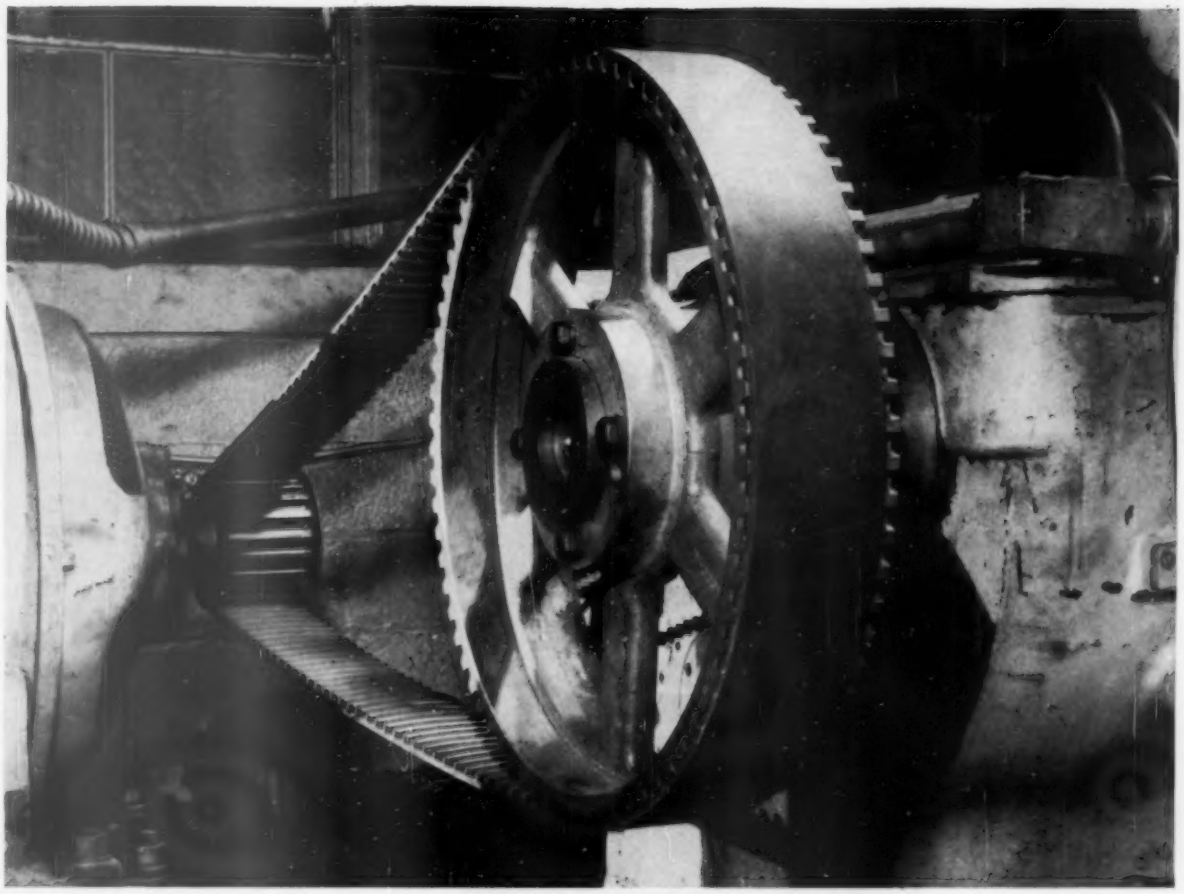
For more data, circle item numbers you want on Reader Service Card.

112—Training instrument uses screen and aural instructions to teach new tasks quickly. Suitable for assembly operations, inspection and testing, maintenance and repair, personnel training. Portable, it reduces errors, increases productivity. *American Systems, Inc.*

113—Sequencing programer, motor-driven, permits individual adjustment of 30 different circuits. Contacts can be opened or closed from 352 to 8 deg. of each revolution. Speeds from 150 down to 0 rpm. In NEMA type 1, 4, 7, 9, 12 enclosures. *Gemco Electric Co.*

114—Pressure regulator maintains constant differential between medium passing through it and any other medium loaded on top of diaphragm. Handles steam, water, air, oil, gas or chemicals, 250 psi. at 450 F. and 300 psi. at 150 F. In ¼- to ¾-in. sizes. *OPW-Jordan Corp.*

Turn the page



Here's how WOOD'S helps you with

PROBLEM-SOLVING, POSITIVE ACTION

Five, easily understood charts, developed by Wood's, permit proper drive design with almost no calculations. WRITE FOR BULLETIN 21103.

Wood's has the drive, the positive action Timing Belt Drive . . . PLUS THE EXPERIENCE it takes to give positive, workable solutions to your power transmission problems. Wood's Timing Belt Drives provide instantaneous, slip-free response . . . *full* power transmission. They require no lubrication, no motor bases, no tensioning devices. Belt matching is eliminated. And, their speed range is exceptional . . . from 0 to 16,000 fpm. Load capacities range up to 600 hp and above. Belts are unusually strong, but they are thin and flex readily, eliminating heat build-up, maintaining high operating efficiency. When you want positive action, investigate Wood's Timing Belt Drives. You'll find outstanding solutions to a wide variety of drive problems.

Woods

T. B. WOOD'S SONS COMPANY

CHAMBERSBURG, PENNSYLVANIA

ATLANTA • CAMBRIDGE • CHICAGO • CLEVELAND • DALLAS

TD/161

Begins on page 122

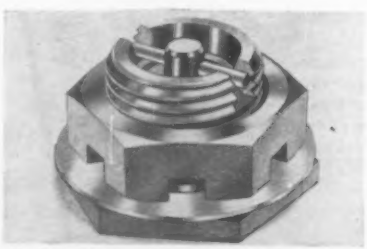
EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

115—Parts storage drawer exposes all parts fully classified and ready for selection, fast issue, or inventory control. Fits into existing cabinets with metal shelves. Glides on heavy-duty ball-bearing suspension system. Many sizes, up to 500 subdivisions. *Cribdrawer Co.*

116—Rotary actuator, driven by air or hydraulic fluid, may be stopped and reversed at any point of 360-deg. cycle. Three models develop 50 to 134 in.-lb. of torque with 100-deg. cycle. Three models develop 50 psi. pressure. Drive shaft is keyed for use with worm or spur gear. *MO-BAR Hydraulics Co.*

117—Battery charger with four circuits has only one motor generator. Easy to install. Costs less than four single-circuit chargers. Automatic controls cut off battery when fully charged. For 12- to 18-cell lead-acid batteries to 30 kw. *Motor Generator Corp.*



118—Lightweight drain valve evacuates fluid from 0.20 in. of tank bottom to absolute bottom, depending on mounting. Can be mounted flush with exterior surface. No intermediate drip positions—just fully opened or closed. Only few drops of seepage an hour. *The Bruning Co.*

Begins on page 122

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

119—Floor grating made of ductile iron provides high strength at low cost for heavy-duty wear. Suitable for drainage and floor reinforcement. Corrosion resistant. Over 50% lighter than iron and steel gratings. Comes in various designs. *Crompton & Knowles Corp.*

120—Tachometer, priced under $100 including pick-up head and cable, offers three ranges and accuracy of 1%. Pick-up uses no brushes; operates up to 1000 ft. from 4-in. indicating meter. Suitable for elevators, conveyors, other handling equipment. *Metron Instrument Co.*

121—Plastic eye visor snap-clips to brim of any style hard hat or cap. It is adjustable for proper distance from wearer's face. Serves as shield against sun glare or to protect against flying fragments. Swings up under hat brim when not needed. *Davis Emergency Equipment Co.*

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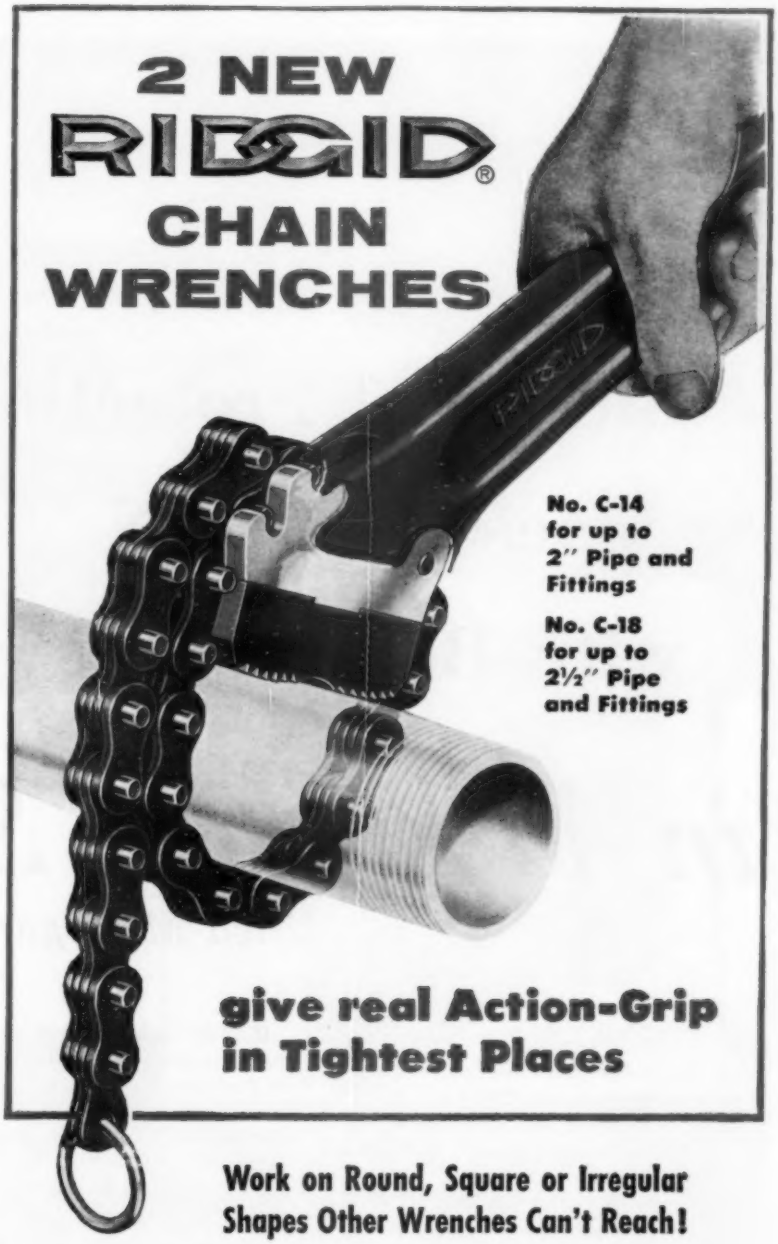
2 NEW RIDGID® CHAIN WRENCHES



No. C-14 for up to 2" Pipe and Fittings

No. C-18 for up to 2½" Pipe and Fittings

give real Action-Grip in Tightest Places

Work on Round, Square or Irregular Shapes Other Wrenches Can't Reach!

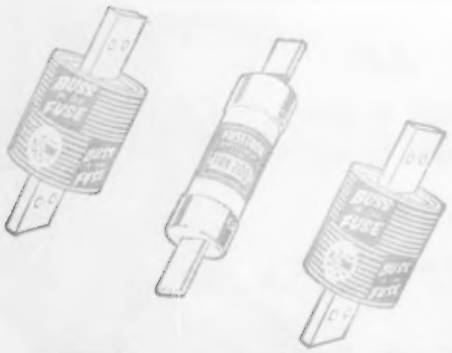
In extra close quarters, there's nothing that'll beat these new RIDGID Chain Wrenches for getting the job done. Fast, ratchet-like action in either direction . . . from either side. Give tight grip without crushing. Large, easy-to-grab end ring for fast chain adjustment. Tempered steel chain locks securely . . . releases quickly. Rugged, comfort-grip, I-beam handle, guaranteed not to break or warp . . . handy hang-up hole.

Light and easy to use, these new RIDGID Chain Wrenches do everything a regular wrench can do . . . and much more. Call your Supply House and get one today!

RIDGID®

The Ridge Tool Company, Elyria, Ohio, U.S.A.

For more facts Circle 464 on Reader Service Card



Electrical Protection goes MODERN with BUSS Fuses...

in All-Electric Schools

Utica Michigan

• *Electricity* heats, lights, pumps water, cooks and operates all motor driven equipment in the West Utica and the Ewell Elementary Schools. No other utility service is used except the telephone.

The complete use of electrical energy puts special emphasis on the need to use the safest, most modern protective devices throughout the electrical system.

In each school, the main switchboard is protected by 3—1600 ampere BUSS Hi-Cap fuses having an interrupting rating of 200,000 amps. rms symmetrical. Thus, safe interruption of fault currents now available is assured,—and the fuses are adequately safe to allow for future system growth.

If a high fault current should occur, the fast opening characteristics of BUSS Hi-Cap fuses further protect the circuits and equipment against damage by restricting let-thru fault currents to safe value.

Feeder and branch circuit protection

To provide the safest short-circuit and overload protection . . . and to prevent needless outages,—FUSETRON dual-element fuses are used in the feeders and branch circuits of these schools.

For modern, all-purpose protection of circuits up to 600 amps., FUSETRON fuses cannot be equalled. They have 100,000 amp. interrupting capacity,—and sufficient time-lag to hold harmless overloads.

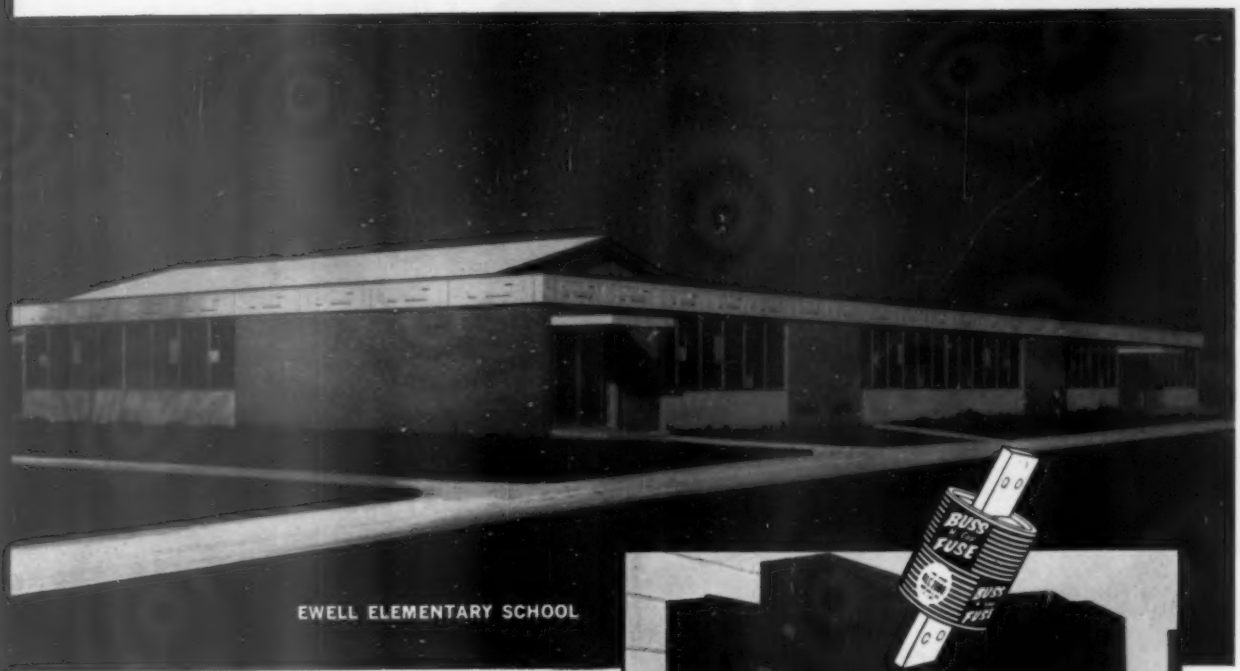
FACTORY

For more information on

FUSETRON dual-element fuses *. . . write for bulletin FIS*

BUSS Hi-Cap fuses *. . . write for bulletin HCS*

BUSSMANN MFG. DIVISION, *McGraw-Edison Co.* **St. Louis 7, Mo.**



EWELL ELEMENTARY SCHOOL

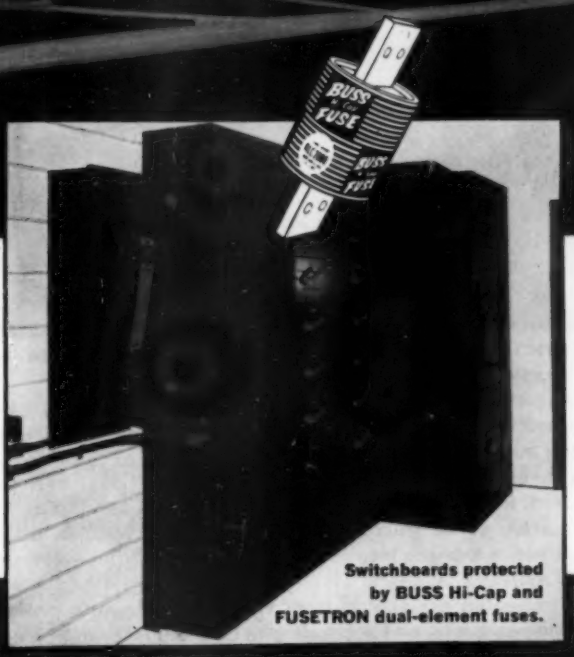
Architects—
SMITH & SMITH / ASSOCIATES
Royal Oak, Michigan

Consulting Engineers—
B. A. KING & ASSOCIATES, INC.
Birmingham, Michigan

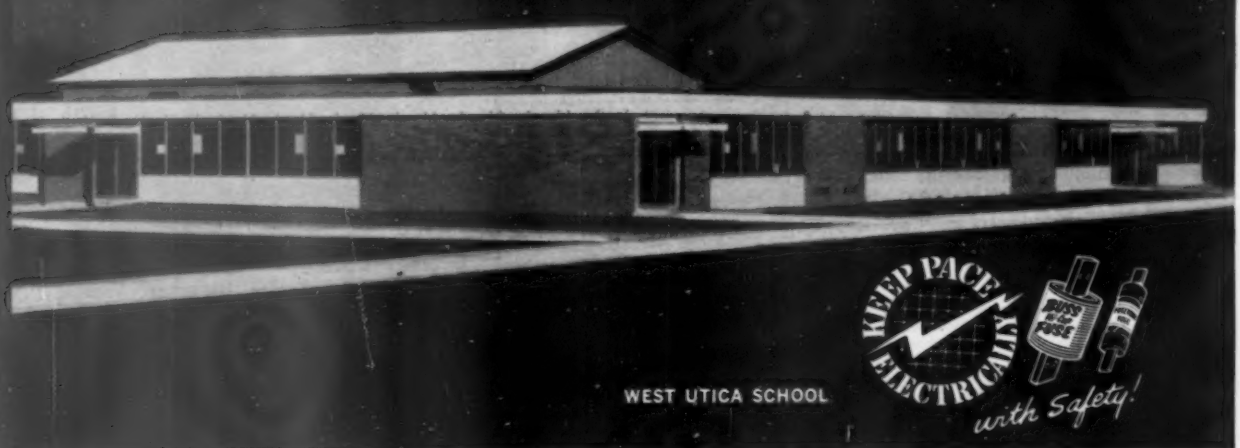
Electrical Contractors—
SCHEPER'S ELECTRIC CO.
Utica, Michigan

General Contractors—
Ewell Elementary School
GILBERT & KERNER
Utica, Michigan

West Utica School
CHISSUS CONSTRUCTION CO.
Birmingham, Michigan



Switchboards protected by BUSS Hi-Cap and FUSETRON dual-element fuses.



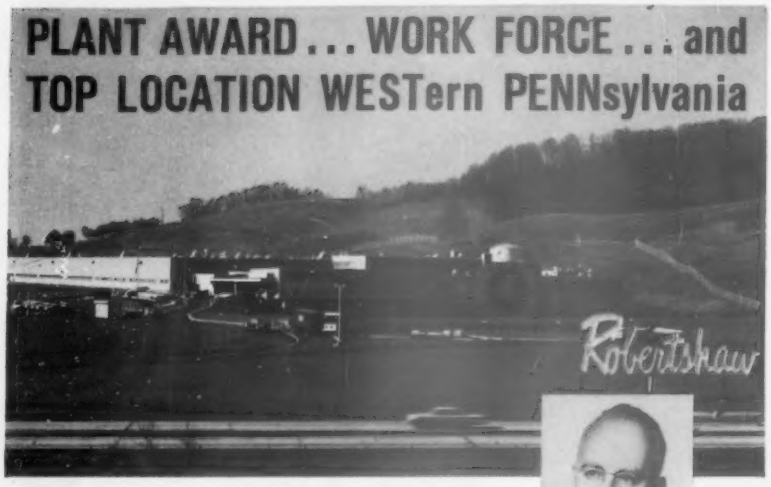
WEST UTICA SCHOOL

KEEP PACE ELECTRICALLY *with Safety!*

For more facts Circle 465 on Reader Service Card

TOP

PLANT AWARD . . . WORK FORCE . . . and TOP LOCATION WESTern PENNsylvania



FRANK H. POST

CITED BY FACTORY MAGAZINE AS ONE OF TEN TOP PLANTS OF 1961
More than 1400 skilled workers are employed by Robertshaw-Fulton Controls Co. in $4 million plant at New Stanton, Pa. New 360,000-sq.-ft. building houses facilities previously in three separate plants.

WESTern PENNsylvania plants have won "top ten" awards for two consecutive years: this year, Robertshaw-Fulton; last year, Screw & Bolt Corp. of America. Fulfilling the exacting requirements of these two industries wasn't easy, but WESTern PENNsylvania filled the bill.

For example, Robertshaw needed a large-acreage site, wanted to retain its trained work force, plus the transportation and advertising advantages of being adjacent to the Pennsylvania Turnpike.

"It takes skilled hands to work on controls," says Frank H. Post, vice president, Robertshaw-Fulton Controls Co. "We can tap all kinds of skills in this area, so we upgrade our output, boost volume, operate at lower costs. Here is a prime location for our three facilities—now under this one superb roof."

With capable assistance from West Penn Power's professional plant location specialists, and accurate and detailed information about the area, you too can plan today for tomorrow's progress in WESTern PENNsylvania —the top plant location.

locate your plant in WESTern PENNsylvania

Send coupon or call:

WEST PENN POWER

an investor-owned light and power company
an operating unit of ALLEGHENY POWER SYSTEM

F 1-R

WEST PENN POWER
Area Development Department, Greensburg, Pa.
Phone. TEmple 7-3009 (Area Code 412)

Please: ☐ Send Plant Location Services Booklet
☐ Send Catalog of Available Plants and Sites
☐ Have Plant Location Specialist Call

Name_____ Title_____

Company_____ Phone_____

Address_____

City_____ Zone_____ State_____

Begins on page 122

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

122—Transistorized timer is rugged, precision instrument accurate to 5/1000 sec. Plug-in type load relay, with expected life of over 10-million cycles, can be replaced quickly. No re-cycling error. Compact, 25 amp., 120 v. unit in three models. *Giannini Controls Corp.*

123—Dwel-Drive transmission permits continuous motion input to stop or dwell momentarily on output side. Comes with 40- or 140-deg. dwell, working torque of 50 ft.-lb. For packaging, punch presses, taping machines that need stamping, labeling. *Remmele Engineering.*

124—Water level switch prevents damage by shutting off motor when pump discharge is not at specified pressure level. For use where bearing, packing glands or motor windings depend on pumped water for lubrication and cooling. Automatic re-start. *U. S. Gauge Div.*

Turn the page

NEW

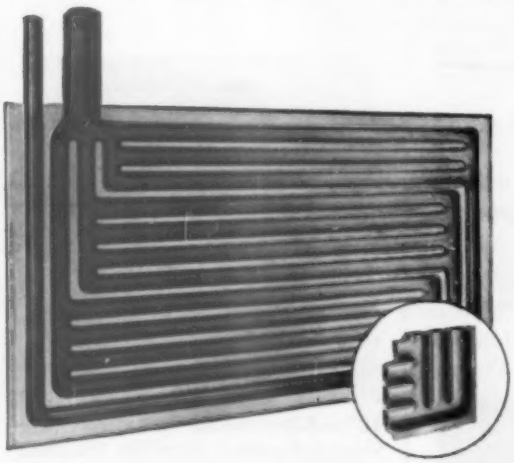
MULTI-ZONE

PLATECOIL®

OPERATING PRESSURES UP TO 250 PSI

Now you can apply the performance and cost advantages of PLATECOIL to tank and process heating with steam pressures up to 250 psi. Higher pressure containment is the result of design and construction refinements such as DURAWELD bonding of plates, new patented MULTI-ZONE pass arrangement and TRANSTEEL mild steel in standard PLATECOIL units. Laboratory tests to destruction have demonstrated a safety factor of 5 to 1.

PLATECOIL SOLVES ALL KINDS OF TANK AND PROCESS HEAT TRANSFER PROBLEMS



PLATECOIL is applicable to a broad range of heating and cooling applications. MULTI-ZONE, header type PLATECOIL, through better distribution of steam, has a reserve of heat transfer capacity for faster "heat-up" and less down time. This reserve capacity also produces extremely fast recovery of desired operating temperatures to keep processing efficiency up. Standard MULTI-ZONE and serpentine (for cooling) units are available in a wide range of sizes.

PLATECOIL units are available in mild steel, stainless steel, Monel, Ni-o-nel, Hastelloy B, Hastelloy C, Nickel and many other metals. All stainless steel and alloy PLATECOIL units affected by cold working are annealed and pickled after fabrication to return the metal to its original condition and thus eliminate the probability of corrosion due to internal stresses and carbide precipitation.

Variations such as double embossed, single embossed (one side flat), banked units and units rolled to specified diameters add to PLATECOIL application possibilities. Surface finishes to meet all types of operating requirements, use of PLATECOIL as structural parts such as tank walls, special connections, hangers and other accessories make PLATECOIL applicable to many special heat transfer problems.

Simplify engineering, installation and maintenance with PLATECOIL — the modern answer to tank heating and cooling problems.

"Platecoil" can be furnished to comply with A.S.M.E. code.

Send for Bulletin P60 for complete information.

Tranter Manufacturing, Inc.

LANSING 9, MICHIGAN

PLATECOIL® DIVISION

if you're thinking of using

the newest screw-type fasteners...

APEX Power Bits for SOCKET HEAD screws (Allen type)

TYPE OF SHANK	HEX SIZE Nominal	HEX SIZE Actual	TO BE USED IN Socket Head Cap Screw	TO BE USED IN Socket Set Screw	Overall Length	Part Number
1/4" HEXAGON DRIVE	1/16	.062	#1	5 & 6	1-15/16	AM-02
	5/64	.077	#2, #3	8	1-15/16	AM-02A
	3/32	.092	#4, #5, #6	#10	1-15/16	AM-03
	7/64	.108	#5	—	1-15/16	AM-03A
	1/8	.124	#8	1/4	1-15/16	AM-04
	9/64	.139	#8	—	1-15/16	AM-04A
	5/32	.155	#10	5/16	1-15/16	AM-05
	3/16	.186	1/4	3/8	1-15/16	AM-06
	7/32	.217	5/16	7/16	1-15/16	AM-07
	1/4	.249	—	1/2	1-15/16	AM-08
5/16" HEXAGON DRIVE	1/8	.124	#8	1/4	3	AS-04
	5/32	.155	#10	5/16	3	AS-05
	3/16	.186	1/4	3/8	3	AS-06
	7/32	.217	5/16	7/16	3	AS-07
	1/4	.249	—	1/2	3	AS-08
	5/16	.311	#10	5/16	3	AS-10
	3/8	.374			3	AS-12
7/16" HEXAGON DRIVE	1/8	.124	#8	1/4	3-1/2	AN-04
	9/64	.139	#8	—	3-1/2	AN-04A
	5/32	.155	#10	5/16	3-1/2	AN-05
	3/16	.186	1/4	3/8	3-1/2	AN-06
	7/32	.217	5/16	7/16	3-1/2	AN-07
	1/4	.249	—	1/2	3-1/2	AN-08
	5/16	.311	#10	5/16	3-1/2	AN-10
	3/8	.374		5/8	3-1/2	2
	1/2	.498				6
	9/16	.560				8
	5/8	.623				10
						12
						16
						18
						20

Insert and power bits to drive the new 7/64" and 9/64" hex sizes have been added to the complete range of Apex tools to drive socket head screws, 1/16" to 5/8" hex sizes.

...the tools you'll need to drive them are already in stock— at Apex!

Cap screw sizes shown in color are new 1960 standards dimensions

We quote promptly on specials.

If you're driving thousands of screws a day, or just a few . . . if you use several types and sizes of screws or just one . . . Apex has the screwdriving tools to help you save time and money. All standard types and sizes in stock . . . specials get "special" attention! For complete information, write for your copy of the new Catalog 30-C.

APEX FASTENING TOOLS

SCREWDRIVING • NUT RUNNING • SPECIAL

The APEX Machine & Tool Co. • 1025 So. Patterson Blvd. • Dayton 2, Ohio

Begins on page 122

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

125—Pocket-size insulation tester provides steady testing voltage without dependence on batteries or other current supply. Eliminates damage from excess voltage. Three models from 100 to 500 v. d-c, up to 100 megohms. Optional scale to 10,000 ohms. *James G. Biddle Co.*

126—Overhead track for cranes, carriers, trolleys withstands heavy swinging loads. Special suspension system eliminates bending stresses, promotes free rolling of wheels. Lightweight, rugged rail sections to 60 ft. long. *Cleveland Crane & Engineering Co.*

127—Air-powered enameler provides full control over film thickness of most coatings such as paint, lacquer. Top loading permits easy handling of small parts. One valve fills and drains. Needle valve adjusts rotating speed. No skills to operate. *Leon J. Barrett Co.*

Turn the page

FACTORY

For more facts Circle 468 on Reader Service Card

Give your factory a new lease on life with LOW-COST Carrier Air Conditioning!

You get six advantages when you air condition your factory with a Carrier Weathermaker* Plan. They range from low-cost installation, maintenance and operation to a schedule that meets your requirements conveniently. For example:

1. The job can be done all at once or step by step—an area, a floor or several floors at a time. Either way, there's no disruption of normal routine procedures. By advance planning, you also get an efficient system—not a wasteful hodgepodge of unrelated installations.

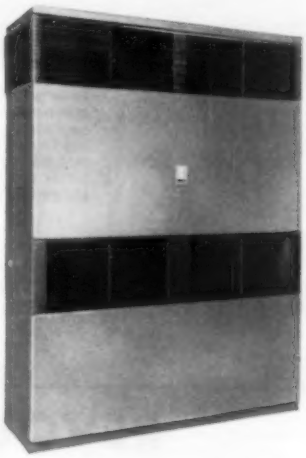
2. If you air condition step by step, you can spread the expenditures for the entire system over a period of years. With Carrier's installation techniques, you pay no special premium for buying air conditioning in stages.

3. Individual Weathermaker units, like the 50 series model shown here, are relatively low in cost and easy to install. This one is ideal for a large open area or a whole floor. Others are designed for a series of partitioned offices.

4. Operating costs are strictly controlled, since these Weathermaker units maintain temperature automatically—operating only when they are needed.

5. You can usually eliminate the expense of hiring an extra engineer or maintenance help since each unit is automatic—easy to turn on and off.

6. Service expense is minimum because of Carrier quality. What's more, Carrier guarantees the motor-compressor in each Weathermaker for a period of five years.



Why not let your Carrier dealer survey your building and suggest the most practical way to air condition it. He'll be glad to do so—and there's no obligation. Call him—he's listed in the Yellow Pages. Or write to Carrier Air Conditioning Company, Syracuse 1, New York.

*Reg. U. S. Pat. Off.

Carrier Air Conditioning Company

For more facts Circle 469 on Reader Service Card

GO-GETTER *Finger Tip Control for Speed, Ease, Safety*

Go-Getter powered lift trucks are available in six basic models in each of four series (stand-on or walkie, explosion proof or standard) with a range of sizes and capacities in each.

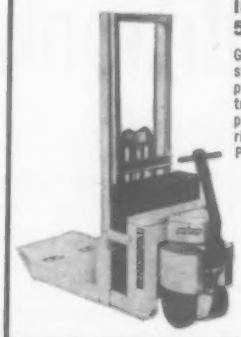
The Go-Getter is fully powered for both traction and lift. Safety factors include fingertip lift control and warning horn. Dynamic brake for downgrade control and deadman mechanical brake for positive stops are controlled by a single directional switch. Stand-on models give the operator a clear view in any direction of travel. Position of operation is fully inside the truck, offering protection from obstructions.

INDEX No. 54.11

Go-Getter low-lift platform model (ride-on explosion proof) for transporting skids. Also in standard and walk-along series.

INDEX No. 52.12

Go-Getter (Walk-along standard) high lift platform model for transporting and high piling skids. Also in ride-on Explosion Proof series.



INDEX No. 52.21

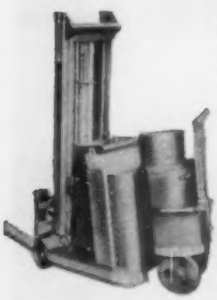
Go-Getter (walkie standard) low lift model for transporting pallets. Also in ride-on and explosion proof series.

INDEX No. 53.22

Go-Getter (stand-on standard shown with overhead guard) high fork lift straddle model for narrow aisle tiering of pallets or skids. Also in walk-along and explosion proof series.

INDEX No. 55.23

Go-Getter (walk-along explosion proof) counterbalanced high lift fork model for tiering skids or pallets. Also ride-on and standard models.



INDEX No. 52.30

Go-Getter (Combination walk-along rider) towing tractor. Also in walk-along only and standard and explosion proof ride-on series.

REVOLVATOR CO.

ESTABLISHED 1904

Designers and Manufacturers of Portable Elevators, Power and Hand Lift Trucks, Hydraulic and Traction Elevators, Carboy and Barrel Dumpers, Portable Cranes, Positioners, Storage Racks, Turntables and Other Material Handling Equipment.

8761 TONNELE AVENUE

NORTH BERGEN, NEW JERSEY

Sales Representatives in Leading Centers

Begins on page 122

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

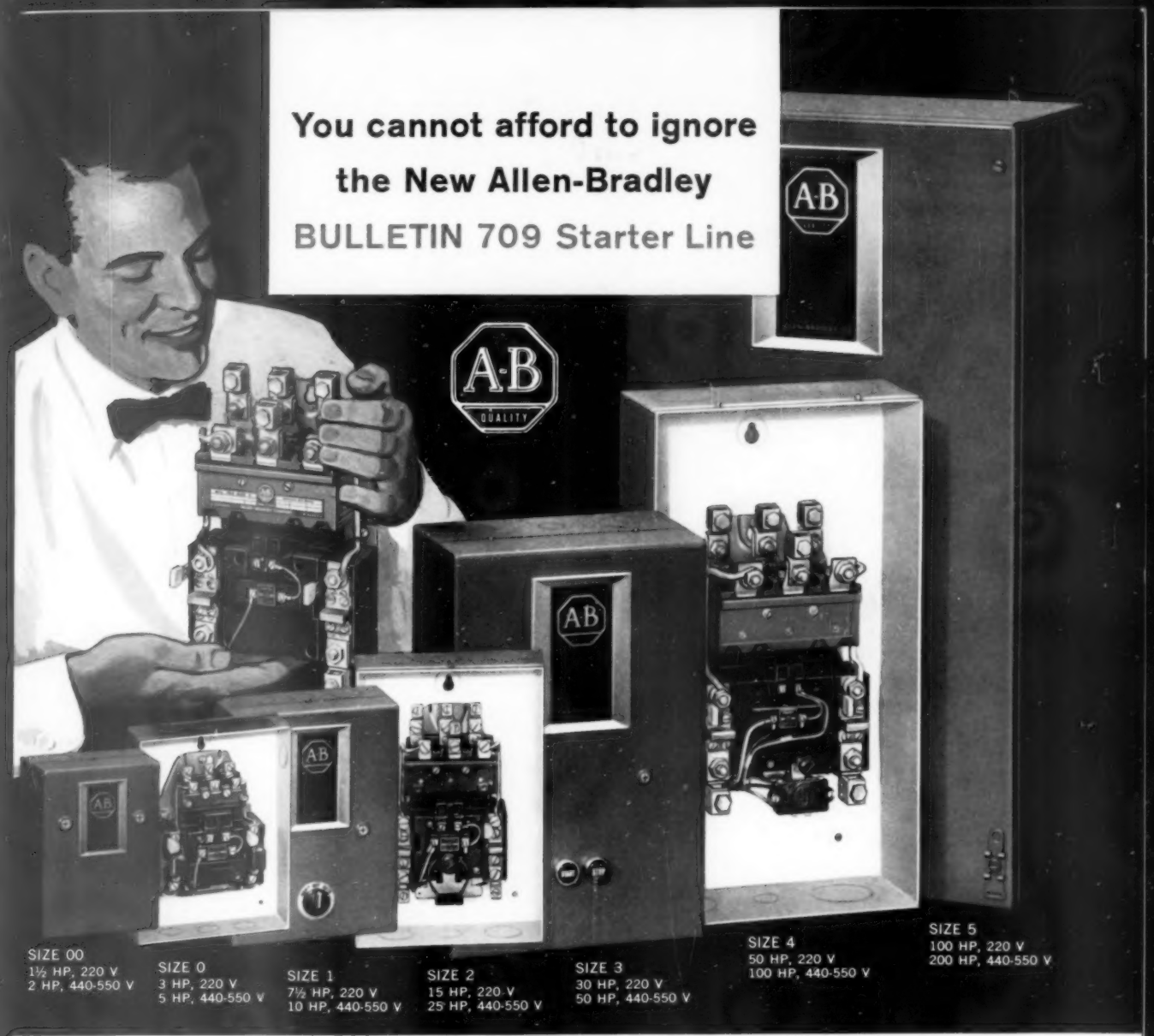
128—Plastics-welding kit is fully equipped to train welders and for maintenance and repair of thermoplastics. Weighs only 12 lb. Steel carrying case. Equipment includes welder with air-flow regulator and gauge. For tack, hand, medium speeds. *Kamweld Products Co.*

129—Fluid level control is accurate up to 250 ft. from sensing probe for liquid, solid, or powder measurements. No drift from voltage changes, ambient temperatures, other influences. Easily adjusted, calibrated set-point control. Easy to install. *Fielden Electronics, Inc.*

130—Counters and tallies, mechanical and magnetic impulse models, are for light- and medium-duty use. Rated at 700 strokes per min., all have external re-sets. Line includes counters for remote control of difficult installations, machine tools, traffic flow. *Hart Mfg. Co.*

131—Ball-type valve provides straight-through flow equal to Schedule 40 pipe. Quarter-turn opens it. Can be serviced by unloosening body bolts, lifting out center section. Externally adjustable Teflon seats. In ⅛- to 2-in. male or female ends. *Pittsburgh Brass Mfg. Co.*

Turn the page



They OUTPERFORM and OUTLAST ALL Others

These new Allen-Bradley starters bring you the greatest advance in reliability and life in all motor control history. Also, they possess a compactness that's almost unbelievable—especially in the higher ratings.

The new Bulletin 709 solenoid starters feature a patented, high-efficiency magnet, which is cushioned to reduce shock and wear. Contacts are of weld-resistant cadmium oxide silver. All coils are "pressure molded" for protection against physical damage and destructive atmospheres. The two or three solderpot overload relays are trip-free and tamperproof. Brooks Stevens, famous industrial designer, has given the new enclosures a styling that adds "eye appeal" to every installation. To get full details, contained in Publication 6100, please write today to: Allen-Bradley Co., 1316 S. Second Street, Milwaukee 4, Wisconsin.

SIZE 00 NOW AVAILABLE

Provides the same long life and reliability as others in the Bulletin 709 family. Rated 1½ HP, 220 V; 2 HP, 440-550 V.

15-G1-MR

ALLEN-BRADLEY

Member of NEMA

QUALITY MOTOR CONTROL

Here Your Motor Starter Dollar Buys

MORE OF THE QUALITIES YOU NEED

BULLETIN 709 SIZE 3
across-the-line solenoid starter in Nema Type 1 enclosure.

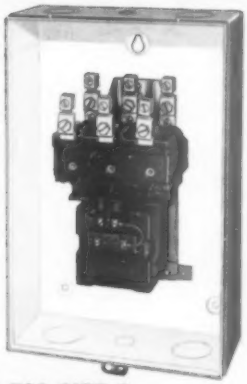
Where else could you possibly obtain – in one complete line – all of the desirable features of the ideal motor control...

1. **Smaller size**
2. **Greater reliability**
3. **Remarkable switching capacity**
4. **Longer life**
5. **Conscientious overload protection**
6. **Simpler installation**
7. **Complete accessibility**
8. **Beautiful appearance – either open or enclosed**
9. **Surprising light weight**

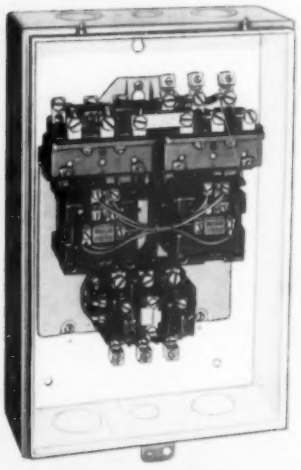
The heart of this new line of magnetic motor starters is the unique solenoid contactor. While it retains the famous A-B one-moving-part principle, it is completely new and far more efficient. This fact is reflected in reduced dimensions for all of these controls. Yet, this contactor design will perform reliably for many more *millions* of trouble free operations.

The new enclosures are very "eye appealing." When the open type starters are assembled into special panels, their neatness and compactness will delight the designers. Full details are in Publication 6100. Please write: Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

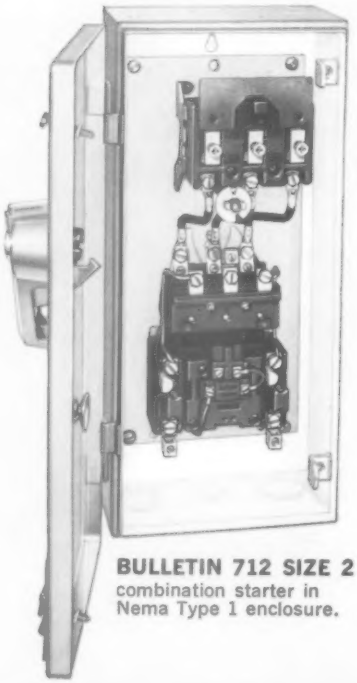
A-B QUALITY



BULLETIN 702 SIZE 3
three-pole, a-c solenoid contactor in Nema Type 1 enclosure.



BULLETIN 705 SIZE 2
across-the-line reversing starter and overload relays in Nema Type 1 enclosure.



BULLETIN 712 SIZE 2
combination starter in Nema Type 1 enclosure.

BULLETIN 715 SIZE 1
across-the-line, two-speed starter—with two overload relays per speed—in Nema Type 1 enclosure.

15-61-MR

ALLEN-BRADLEY

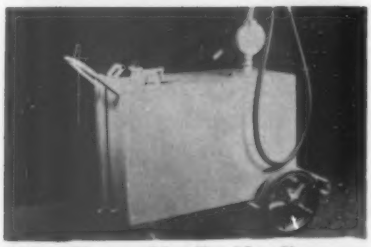
Member of NEMA

QUALITY MOTOR CONTROL

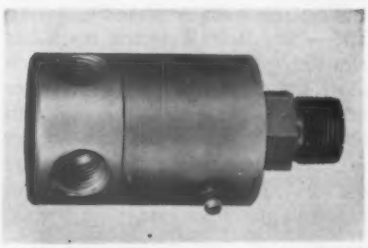
Begins on page 122

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.



132—Flammable liquids dispenser moves to job site on rubber wheels to replenish safety and bench cans and wash tanks. Transfer pump has 6-ft. neoprene hose grounded to prevent static building during operations. No spillage. Pumps 6 gpm.; capacity, 60 gal. *Protectoseal Co.*



133—Rotating union permits liquid to enter and exit from same or different ends. Features an end-face mechanical seal and lubricated ball bearing. Easy to disassemble and repair in minutes with standard tools. Handles up to 100 psi. at 5000 rpm. to 400 F. *Jani, Inc.*

134—Fire truck is Cushman truckster outfitted with pumps and tanks, ladders and racks, axes, emergency lanterns and extinguishers. Can be driven to areas inaccessible to standard fire-fighting equipment. Slim enough for narrow aisles; 90-in. turning radius. *La France, Ltd.*

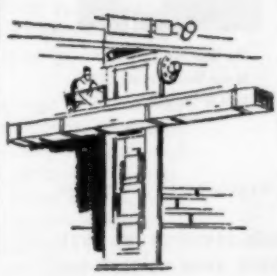
Turn the page

CONCO OVERHEAD TRAVELING CRANES

in capacities to 150 tons

Conco Semi-Gantry Crane custom-engineered for service in a Chicago area steel mill

CRANES HOISTS CONCO



Write for Crane Specifications Tablet containing five sets of general service crane specification data and forms.

For information on Conco Cranes, Hoists and Trolleys Request Bulletin 50008

Material Handling Division
CONCO ENGINEERING WORKS, INC.
Mendota, Illinois

AFFILIATES:
SPARTAN TOOL DIVISION, Powered Sewer Cleaning Equipment
FIELD CONTROL DIVISION, Barometric Draft Controls
CONCO BUILDING PRODUCTS, INC., Brick, Tile, Stone.

CHICAGO TRAMRAIL, manufacturer of "Trak-Rak" Stacker Cranes, Monorail Systems, and "Fas-Lok" Storage Racks at 1330 S. Kostner Ave., Chicago, is now a DIVISION OF CONCO ENGINEERING WORKS, INC.

For more facts Circle 472 on Reader Service Card

This is the cooler that pioneered a trend

Just a little over a year ago no one ever saw a cooler like this. We call it the Wall-Mount, truly a Halsey Taylor first.

It mounts on the wall . . no exposed fittings, no space behind cabinet to catch dirt or grime! Off the floor . . room underneath for easy cleaning! The answer to maintenance-free installation and, like all Halsey Taylor fixtures, gives years of trouble-proof service.

The Halsey W. Taylor Co., Warren, Ohio

The Wall-Tite, big brother to the Wall-Mount. Fits tight to the wall.

Halsey Taylor®

Write for latest catalog, or see Sweet's or the Yellow Pages

THIS MARK OF LEADERSHIP IDENTIFIES THE MOST COMPLETE LINE OF MODERN DRINKING FIXTURES

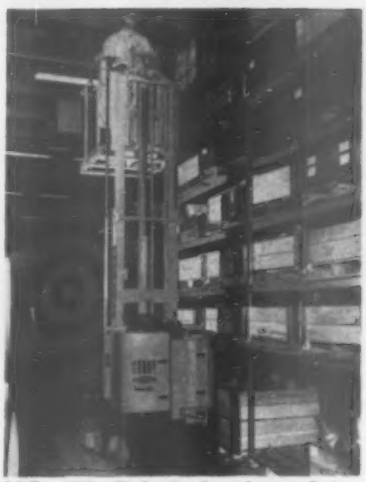
263

For more facts Circle 473 on Reader Service Card

Begins on page 122

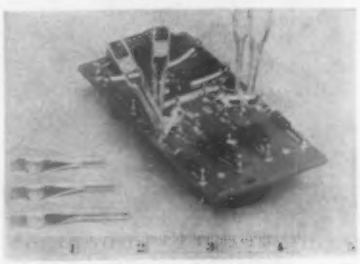
EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.



135—"Hy-Drive" electric truck has elevating platform to carry man aloft for maintenance work, order selection, etc. Controls on platform allow height adjustment and movement of truck while elevated. Safety devices govern speed, platform travel limit. *The Raymond Corp.*

136—Hose valve for wash-down and air-blow applications handles corrosive fluids at 13 gpm., 75 psi. Fits ½- to 1-in. ID hose. Has stainless steel body, nozzle, plunger. Bubble-tight shut-off. No packing problems, no leakage, no springs. *General Kinetics Corp.*

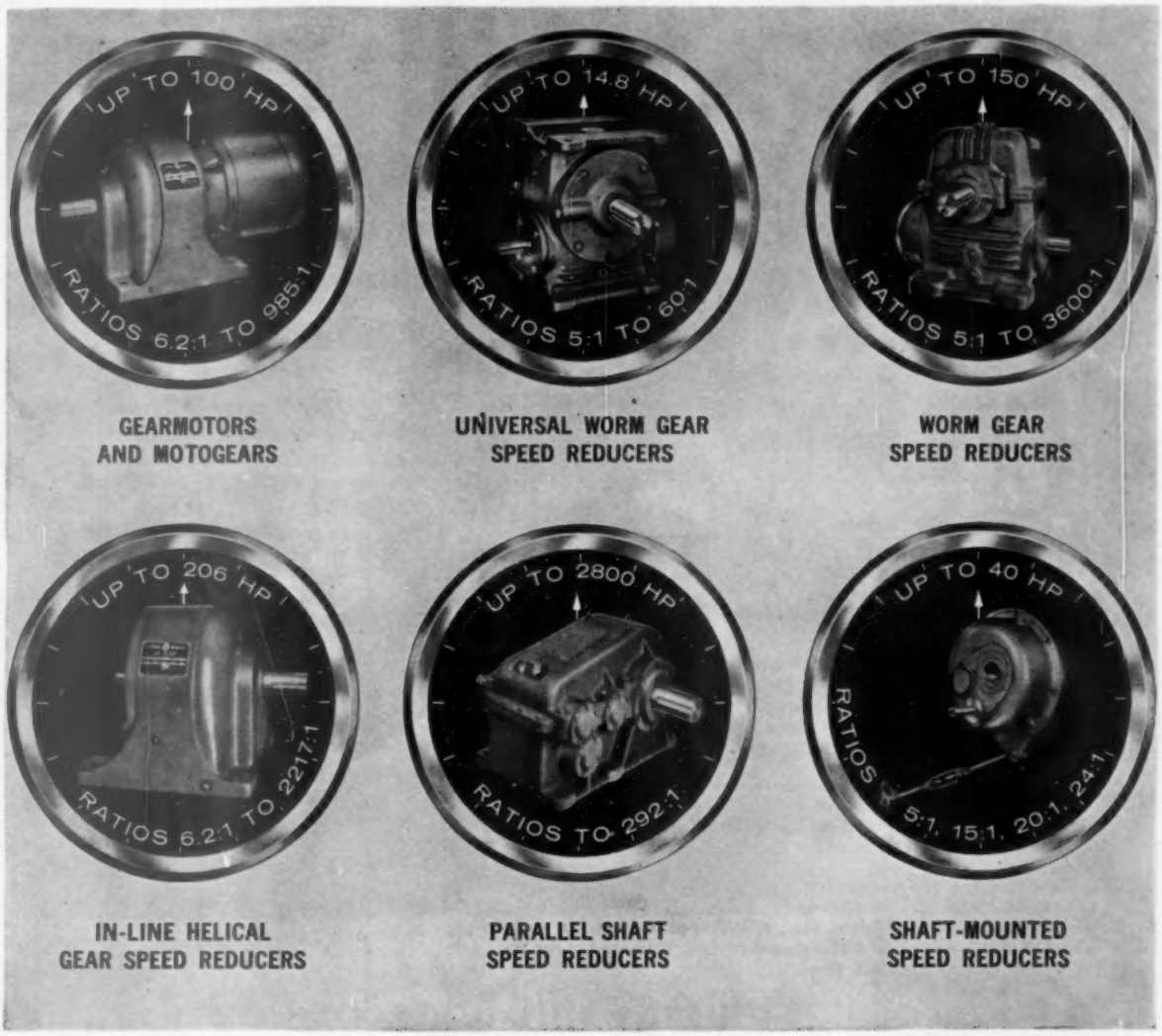


137—Heat dissipating clamp absorbs wire heat when soldering connections on printed circuit board. Saves components from damage. Slim aluminum jaws, 1/16 in. wide, permit clipping in hard-to-reach points. Will not mark or injure wire. Three sizes. *Macdonald & Co.*

Turn the page

LINK-BELT SPEED REDUCERS . . .

geared for every speed and need


UP TO 100 HP
RATIOS 6.2:1 TO 985:1
GEARMOTORS AND MOTOGEARS
UP TO 14.8 HP
RATIOS 5:1 TO 60:1
UNIVERSAL WORM GEAR SPEED REDUCERS
UP TO 150 HP
RATIOS 5:1 TO 3600:1
WORM GEAR SPEED REDUCERS
UP TO 206 HP
RATIOS 6.2:1 TO 2217:1
IN-LINE HELICAL GEAR SPEED REDUCERS
UP TO 2800 HP
RATIOS TO 292:1
PARALLEL SHAFT SPEED REDUCERS
UP TO 40 HP
RATIOS 5:1, 15:1, 20:1, 24:1
SHAFT-MOUNTED SPEED REDUCERS

industry's most comprehensive speed reducer line!

With Link-Belt's broad line to choose from, you can plan *any* speed reduction setup . . . exactly meet your requirements for ratio, space, shaft position, shock loading and other service factors. Link-Belt's seven basic types of speed reducers—each in a wide range of sizes and ratios—give you complete flexibility in drive layout.

There's another important advantage in calling on Link-Belt for your speed reduction needs. Link-Belt makes all related drive components—chains and sprockets, bearings, couplings—all dimensionally correlated with these reducers. This one-source service assures you of a smooth-working, perfectly matched set of equipment. No alignment problems . . . no need to exchange drawings with other suppliers.

See the Yellow Pages for your nearest Link-Belt office or authorized stock-carrying distributor. Look under "Speed Reducers." Ask for catalogs on any or all of the speed reducers shown above.

LINK-BELT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in all Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs; Switzerland, Geneva. Representatives Throughout the World. 15.702

Buy Equipto -- Industry's choice for Quality Products

Heavy Duty Storage

Bulky Storage

Double Deck Shelving

Try a bundle— YOU'LL LIKE IT!

Specialized Applications

Equipto SLOTTED ANGLE

lets you build anything you can think of!

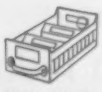
Remember all the different things you could make with an Erector set? Then think of Equipto's Slotted Angle – a man's size piece of steel utilizing nuts, bolts, slots and holes. It's a versatile piece of metal that lets you build anything – carts, benches, stairs, racks, mezzanines and many other useful time-saving structures.

The sheer simplicity of Equipto Angle makes the job of assembly highly economical in terms of manpower – just cut and bolt together. No waste – structures may be disassembled and material re-used. Not merely electro-plated, but hot dip galvanized for maximum rust prevention.

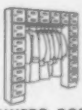
Equipto Angle is the standard of the industry. 1—Available in either 12 or 14 gauge. 2—Comes in convenient lengths packed 10 angles to a bundle with hardware. 3—Two sizes, 1½" x 2¼" and 1½" x 3". 4—Bolts are standard and interchange with other materials. Write today for your free copy of Equipto Angle Idea Book.

SHELVING

BENCHES


DRAWER UNITS

LOCKERS


EQUIPTO ROBE

STOCK CARTS

EQUIPTO ANGLE

Equipto – 812 Prairie Avenue, Aurora, Illinois

☐ Please send me a free copy of your Equipto Idea Book.
☐ Have engineer call to survey our plant for suggested uses.

NAME_____

FIRM_____

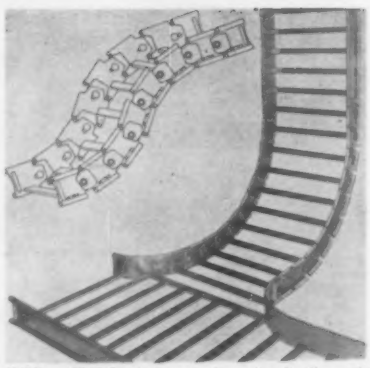
STREET_____

CITY_____ ZONE____ STATE_____

Begins on page 122

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

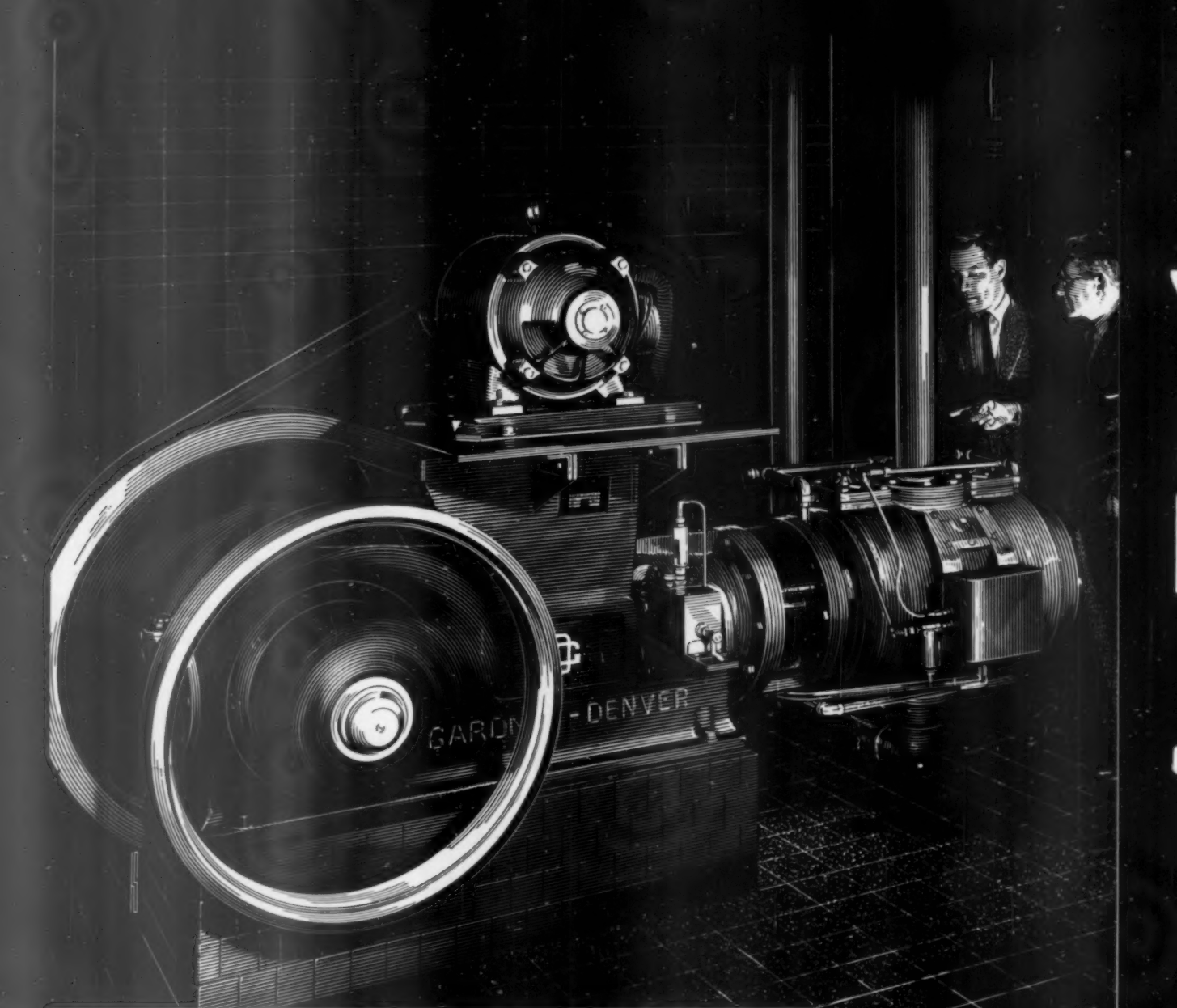


138—Cable tray system includes elbows that are factory-assembled and shipped as straight pieces. Once installed, elbow holds shape. Can be altered to compensate for few inches in misalignment of sections it joins. In 10-ft. sections, various widths. *H. K. Porter Co.*

139—Pipe jacketing, said to protect outdoor ductwork for 20 years, is fire-resistant, remains flexible at 355 F., and resists fatigue at zero F. Made of aluminum foil and glass reinforcing strands adhesively bonded to polyvinyl fluoride film. *American Sisalkraft Co.*

140—Mobile crane, 2-ton capacity, permits one man to lift, transport, and position loads in single operation. Fits 82-in. doorway, reaches to 10 ft., or to 12 ft. 3 in. with extension boom. Uses two-speed hydraulic system for speed and power. *Ruger Equipment, Inc.*

Turn to page 150



"No more oil to spoil our quality"

. . . the reaction to Gardner-Denver oil-free compressors. They protect product quality by delivering pure, clean air—air that never has a drop of oil in it. So if even a trace of oil in your air line is too much, see Gardner-Denver first. Write for bulletin CRC-10.

Gardner-Denver Company, Quincy, Illinois—Offices in principal U.S., Canadian and Mexican cities
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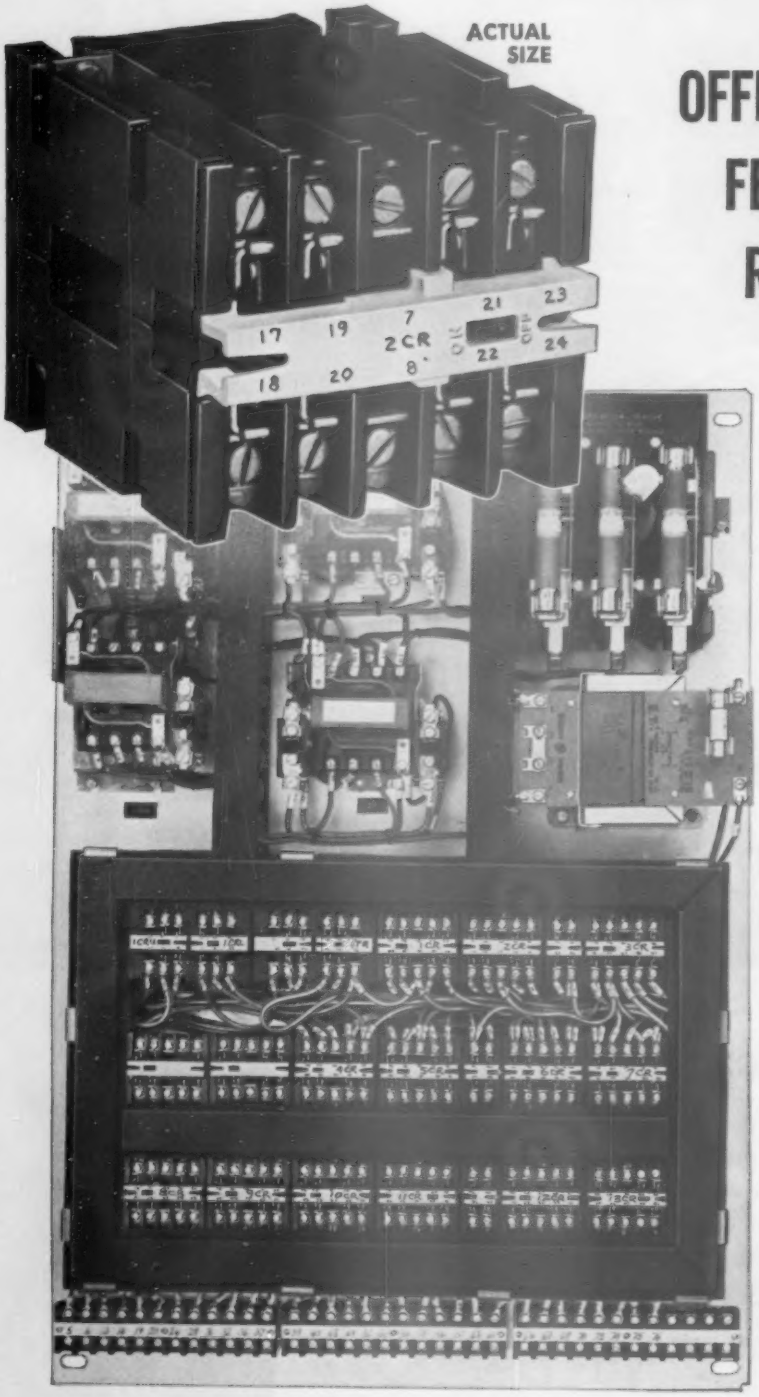
GARDNER-DENVER Since 1859

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

NEW General Electric 10-amp,



OFFERS 4 SIGNIFICANT FEATURES NO OTHER RELAY CAN MATCH!

1. *ONLY* 300-VOLT RELAY WITH CONVERTIBLE CONTACTS

You can change contacts from normally open to normally closed in 90 seconds . . . with only a screwdriver. Coils too, can be changed in seconds . . . and you can make up any form you need through 8 poles from basic 4-pole relay. Result: increased flexibility, reduced inventory costs.

2. *ONLY* 300-VOLT RELAY TO FORM ITS OWN WIRING TROUGH

New CR120 relays eliminate need for separate wiring trough—require only 5⅝ square inches of mounting area. Result: panel size is substantially reduced because you can mount more relays in a given space.

3. *ONLY* 300-VOLT RELAY WITH ALL TERMINALS OUT-IN-FRONT

There's no double-decking of terminals to complicate hook-up. Wiring and maintenance are simple because *all* terminals are out-in-front where they are most accessible. Result: important savings in installation and maintenance time and costs.

4. *ONLY* 300-VOLT RELAY OFFERING ALL THESE FORMS

Choose from standard 2-, 4-, 6-, and 8-pole relays and latched and pneumatic timer forms. Also available are 2-pole adder kits, allowing you to assemble 6- and 8-pole relays from basic 4-pole form.

Your General Electric sales engineer has a sample of this new 300-volt relay. Call him today for a demonstration. Or, write for publication GEA-7329, General Electric Co., Section 811-26, Schenectady 5, New York.

SNAP-IN TROUGH COVER between top and middle rows of relays (on lower half of panel above) has been removed to show how relay sides form own wiring trough. Space-consuming wiring trough is eliminated, and relays can be mounted closer together.

Progress Is Our Most Important Product

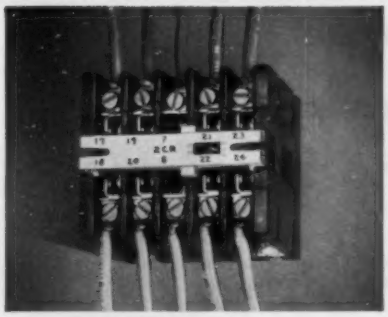
GENERAL ELECTRIC

FACTORY

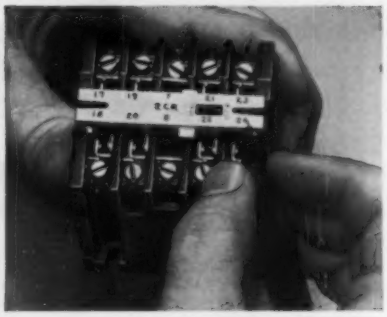
300-volt industrial relay...

Save Panel Space, Installation Time With These Design Features

90-SECOND CONTACT CHANGE—Convertible contacts may be changed from normally open to normally closed with only a screwdriver . . . in the field. Allows you circuit flexibility, reduces your relay inventory.

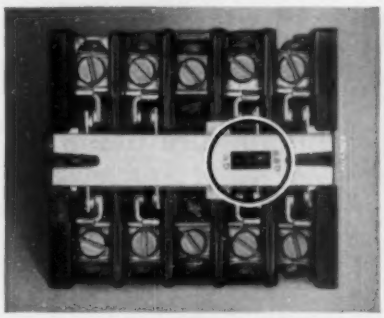


ALL TERMINALS IN FRONT—Have terminal-board accessibility—no need for double-decking . . . even on 8-pole forms. Result: *complete* accessibility from the front means installation time is greatly reduced.

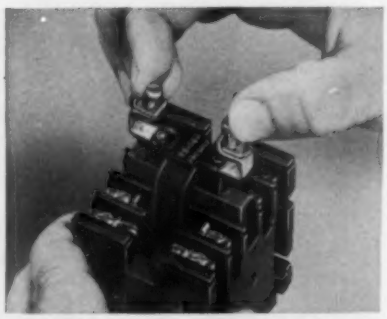


HANDY WRITE-ON MARKING STRIP—White nylon marking strip lets you label each relay and all wires. Result: visual identification of relay and wire numbers saves time when inspecting or trouble shooting.

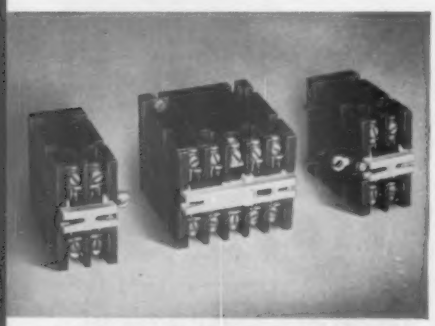
WIDELY-SPACED TERMINAL BARRIERS—Plenty of space between terminal barriers (⅜ inch) allows you easy access with standard screwdriver for connecting leads. Large pan-head screws add to ease of hookup.



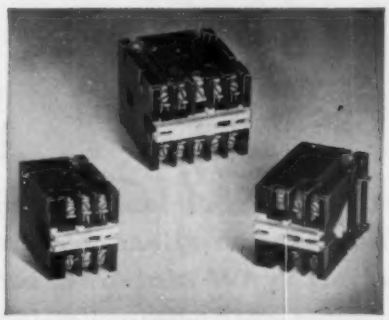
VISIBLE CONTACTS—All contacts are visible at a glance. You can check panel functions manually by moving indicating tab. ON-OFF identification on marking strip indicates whether or not coil is energized.



30-SECOND COIL CHANGE—Inspect or replace coil by loosening two screws and pulling out coil. Can be done without the use of special tools . . . and without removing the relay from the panel.



BUILDING BLOCK POLE-ADDERS—Two-pole adders can be mounted on sides of basic relay to give 6- or 8-pole device. Allows you building-block flexibility . . . in the field. All forms also available from factory.



COMPATIBLE DESIGN FOR ALL FORMS—Same design used for latched relays, relays and timer (1 to r). Height, wiring arrangement, and terminal locations are alike for all forms. Result: simplified installation.

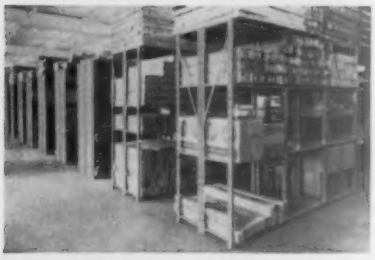
HIGH CONTACT FIDELITY—Self-cleaning contacts have unique "scrubbing" action. Movable contact springs are mounted at an angle so contacts slide over each other to wipe off contaminants.

GENERAL ELECTRIC

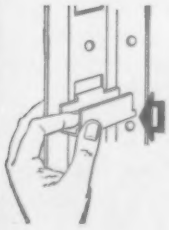
For more facts Circle 477 on Reader Service Card

look at BORROUGHS STEEL SHELVING as a sound investment!

EVERY DOLLAR invested in Borroughs Steel Shelving goes right to work paying dividends in long, efficient, economical storage service. That's because Borroughs Steel Shelving is engineered to provide the finest storage facility possible. Borroughs offers one of the industry's widest assortments of heights, widths and depths, which assures "custom dimension" shelving for all sizes and shapes of materials, and to fit all storage areas. Posts are specially formed for strength that is second to none — entire shelving units can be assembled without special tools — shelves are adjustable without nuts or bolts—and you haven't heard the whole story yet! Write us today!

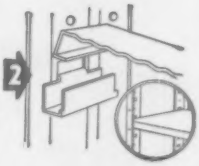


this feature alone should swing you to Borroughs!



Insert 4 shelf support brackets with finger-tip ease — no fumbling with studs, bolts, nuts or lock washers.

Tilt shelf into support brackets with the greatest of ease—shelf is ready for loading.



send for catalog

Represented in Sweet's Catalog, Plant Engineering File 4G BO

BORROUGHS MANUFACTURING COMPANY
OF KALAMAZOO
A SUBSIDIARY OF THE AMERICAN METAL PRODUCTS COMPANY OF DETROIT
3020 NORTH BURDICK ST. amp KALAMAZOO, MICHIGAN

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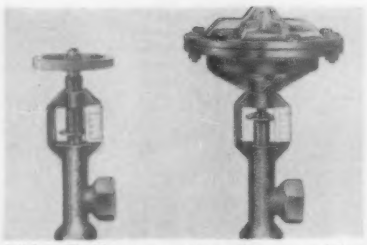
EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

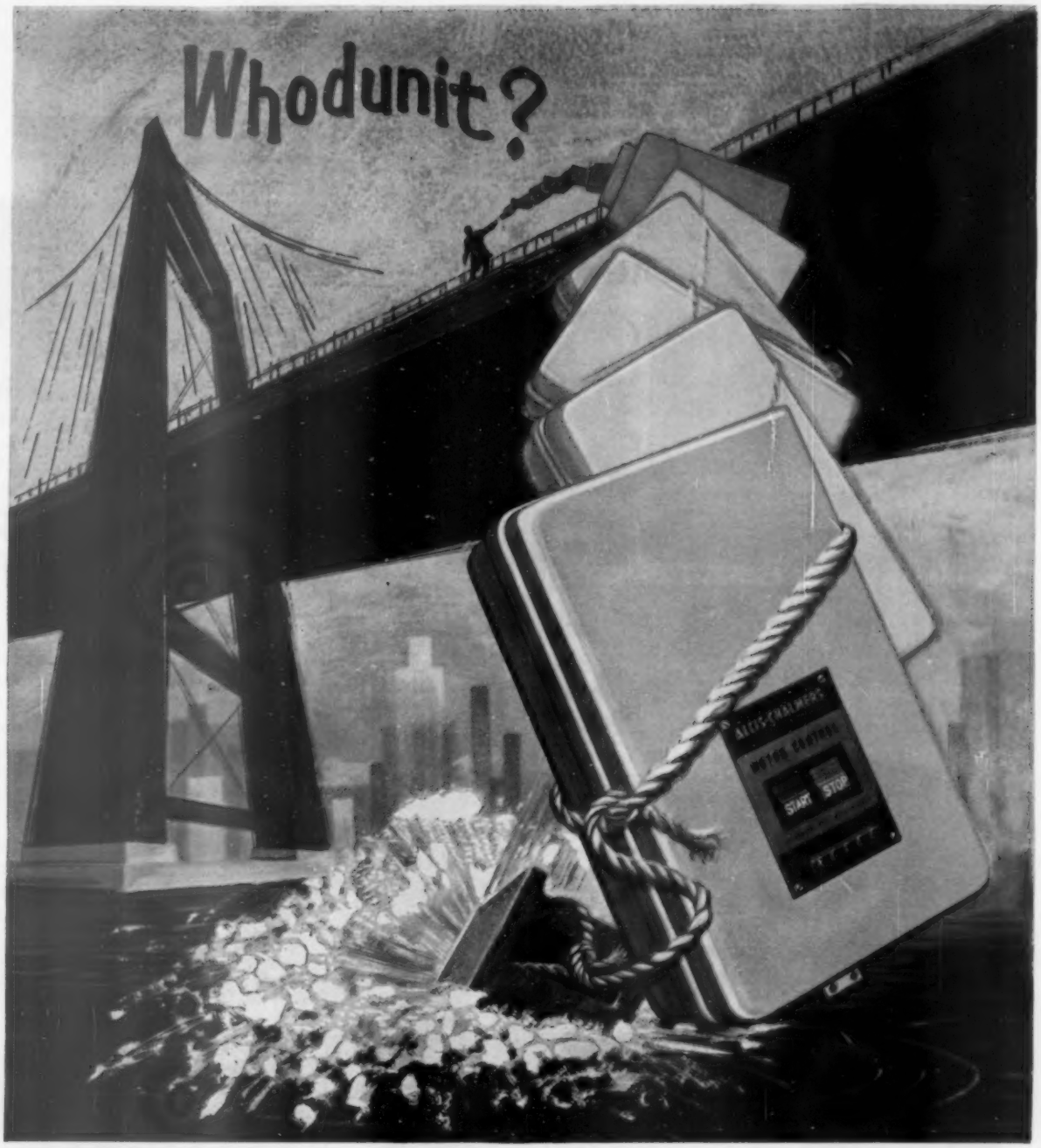


141—Indicator valve shows orifice position clearly on outside scale. Permits setting with extreme accuracy. Locks with optional handle. Outside threads never contact flowing medium—no corrosion or galling. In ⅛- to 4-in. sizes to 10,000 psi. *Flow Systems, Inc.*

142—Fork truck, in 4000-lb. capacity, has free flotation power train so all load stresses are carried by truck frame. Dual wheels improve traction. Has 9-ft. lift, with 10-deg. tilt backward and forward. Priced $1000 under competitive units. *O. W. Kromer Co.*

143—Self-lubricating bearing has steel outer sleeve filled with oil at factory. Provides continuous oil film between bearing bore and shaft for extended period. For hard-to-reach places, or where periodic lubrication is uncertain. In ⅛- to 1⅜-in. sizes. *Carter Mfg. Co.*

Turn the page



Recently our Manager of Renewal Parts Sales threatened to throw our entire line of modern, compact, easily-maintained, quickly-modified, low-voltage motor controls into the drink. Why? Because it's running him out of business! He doesn't sell a fourth of the replacement parts he used to.

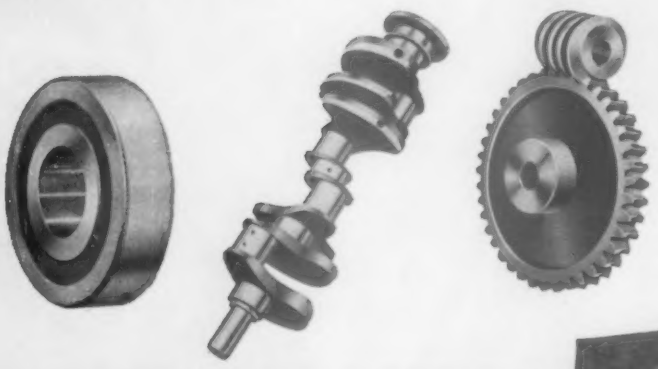
Two years ago, when our engineers designed the bulk out of the Allis-Chalmers low-voltage motor control, they built simplicity into it. And with simplicity came outstanding reliability. Our nation-wide stocks of replacement parts are gathering dust. And warranty returns are negligible.

These controls don't work under water, of course. But they do perform faithfully under practically any other conditions. And they're *still* the most advanced control design in the industry. All sizes from 00 to 9 are available from your A-C distributor. *See him for more facts or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.*

A-1485

ALLIS-CHALMERS

VALVOLINE
Tectyl
PROTECTS
METALS AGAINST
RUST



There's a job for Valvoline Tectyl in your industry, protecting metal surfaces against rust and corrosion during shipping and storage.

Low-cost Tectyl rust preventives are widely used by the military services and by industry.

Tectyl's easy-to-apply, easy-to-remove film provides complete protection from the effects of snow, rain, salt air, humidity, perspiration and corrosive fumes.

Tectyl rust preventives meet exacting government specifications and there are more than 40 variations to meet every industrial need. *We suggest you write today for your copies of two helpful, detailed Tectyl charts which give industrial and government specifications and applications.*

VALVOLINE
Tectyl RUST PREVENTIVES
VALVOLINE OIL COMPANY
Division of Ashland Oil & Refining Company
Refinery — Freedom, Pennsylvania • Home Office — Ashland, Kentucky

Begins on page 122

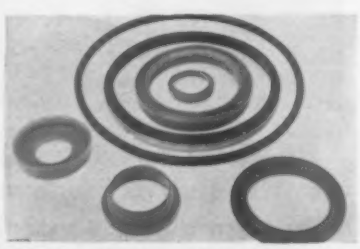
EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

144—Pneumatic tire has extra-thick tread for use where extreme durability and cut-resistance is essential. Made of special rubber and tempered cord that resists gouging and abrasion. Heavy zigzag lugs provide sure traction and braking. *Goodyear Tire & Rubber Co.*

145—Mobile parts cleaners use non-flammable and non-toxic Freon solvents to remove dirt and grease quickly. No loss of Freon; air recirculation recovers it for re-use. Handle delicate parts in all shapes, sizes. Adapt to conveyor in-line feeding. *AutoSonics, Inc.*

146—Square fluorescent lamps, in waffle or coil pattern, fit directly into existing 9-in. recessed incandescent fixtures. Need only instant starting ballast. Said to have 10,000-hr. life. Give as much light as 4-ft. tube. Each lamp is under 2 in. thick. *El-Tronics, Inc.*



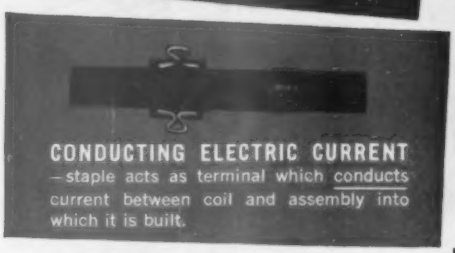
147—Hydraulic seals and packings of urethane have high tensile strength to withstand pressures of 3000 to 10,000 psi. without back-up rings. Chamfered sealing lip prevents leakage at low pressures. Operate in −40 to +225 F. Many forms. *Disogrin Industries.*

Turn the page

LINKING NOVELTY JEWELRY—staple links pieces and becomes part of finished article.

FASTENING HARNESS ASSEMBLY—insulated staple fastens radio harness strands safely with ends bent back so they cannot harm harness.

ARMORING GLOVES—the gloves used in handling rough castings wear fast—staples prevent wear where it's greatest.



CONDUCTING ELECTRIC CURRENT—staple acts as terminal which conducts current between coil and assembly into which it is built.

STOPPING BALL POINT FILLER—the wrap-around staple stops spring travel on ball point pen filler.

BINDS HOSE CONNECTION—rubber hose is fastened to a brass connection with a wrap-around staple which binds rubber to brass for a secure grip.

YOU CAN USE BOSTITCH STAPLING TO MAKE ALMOST ANYTHING

CLINCHING TOY RAILROAD TRACK—track is clinched to ties by wrap-around staple. Track is not pierced by staples.

AND MAKE IT BETTER

For each stapling idea on this page, someone thought, "It might look better, work better, and cost less if we manufactured it with staples."

Then a Bostitch Economy Man—one of 350 in 123 U. S. and Canadian cities—was called in to match the staples and the stapler for the job.

Bostitch can supply over 200 kinds of staples, over 800 types of stapling machines, so you'll have the right one for your product, display or package.

There may be a way that stapling can benefit your business. Look up "Bostitch" in your phone book and call your Bostitch Economy Man. Or just tell your receptionist you want to see him the next time he calls. For further information, write for broadside, "Fasten it better and faster."

Fasten it better and faster with

BOSTITCH
STAPLERS AND STAPLES

609 Briggs Drive, East Greenwich, Rhode Island

ERIEZ Magnetic Minute

60 seconds that will help you improve operating efficiency.

Protect Your
MACHINERY, PRODUCTION, and REPUTATION AGAINST DANGEROUS TRAMP IRON

Get positive protection against costly, damaging tramp iron and fine ferrous contamination with Erium® Powered Permanent Plate Magnets. Here are a few of the many reasons why Eriez Magnetic Separators are your best buy:

- GREATEST SELECTION: Choose from 14 magnetic strengths, and many special features for most efficient performance on your particular separating job.
- USE ANYWHERE: In Chutes, spouts, ducts, feed tables and housings, and for suspension over screens, moving conveyors, etc.
- RUGGED CONSTRUCTION: All models have magnetic element permanently sealed against loss of magnetic strength . . . will withstand severest applications.
- FLEXIBLE: Uniform installation dimensions makes all models and strengths interchangeable.

Take advantage of the most versatile line available. Get the model with the Erium® power source that meets your exact needs. Full data in our new bulletin. Write to:

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70WA Magnet Dr., Erie, Pa.
ERIEZ OF CANADA LTD.
P. O. Box 5, Sta. W. — Toronto, Ont.

MAGNA-THOUGHT

The goodwill a company enjoys rests, in the final analysis, on the intrinsic quality of its products.

E. C. MILLER
Executive Vice President

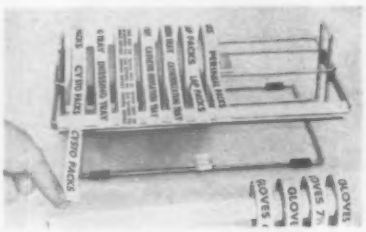
ERIEZ

A GROWTH COMPANY . . .
10 NEW PRODUCTS IN THE LAST 5 YEARS

Begins on page 122

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.



148—Tape dispenser handles wide variety of pressure-sensitive tapes. Adapts to both 1- and 3-in. roll cores. Nickel-chrome plated finish is easy to clean. Blade along 15½-in. front permits cutting with slight finger pressure. Portable or bench-mounted. *Noel Mfg. Co.*

149—Power capacitors, 50 and 100 kvar., fit into existing 25- and 50-kvar. racks. Compact size reduces mounting, handling costs. Tiny Tim model (50 kvar.) weighs only 62 lb. With single or double bushings, 2400 to 7960 v., single-phase. *Federal Pacific Electric Co.*

150—Portable sump pump, easily carried by one man, can be operated by small portable compressor. Handles clear or dirty water, oil, sewage, or light sludge. Has rated water delivery at 90 psi. from 197 gpm. at 10-ft. head to 68 gpm. with 80-ft. head. *Ingersoll-Rand Co.*

Turn the page

ERIEZ Magnetic Minute

60 seconds that will help you improve operating efficiency.

NOW!
THERE'S AN ERIEZ MAGNETIC DRUM FOR MOST EVERY INDUSTRIAL APPLICATION—LARGE OR SMALL

Whether you're processing fine, lightweight material or bulky, highly abrasive material, you'll find an Eriez magnetic drum separator to fit the job.

New 30″ and 36″ diameter Drums, capable of handling volumes up to 25,600 cu. ft. per hour, expand the Eriez line of magnetic drum separators to provide efficient removal of iron contamination in more industrial processes than ever before! Eriez drums now include sizes from 12″ to 36″ in diameter and widths of 8″ to 84″.

All models have these exclusive Eriez features: easy access to bearings without disassembling drum; simple removal of drum from housing without removing housing from flow line; convenient inspection panels at front and back of drum housings.

Models include magnetic drums and controlled-feed, packaged drum separators complete with housing and motor drive . . . standard and heavy duty constructions . . . with high intensity ERIUM®-Powered magnetic circuits for greatest separation efficiency.

For further information and consultation at no obligation, write:

ERIEZ MANUFACTURING CO.
70WB Magnet Dr., Erie, Pa.
ERIEZ OF CANADA LTD.
P.O. Box 5, Sta. W — Toronto, Ont.

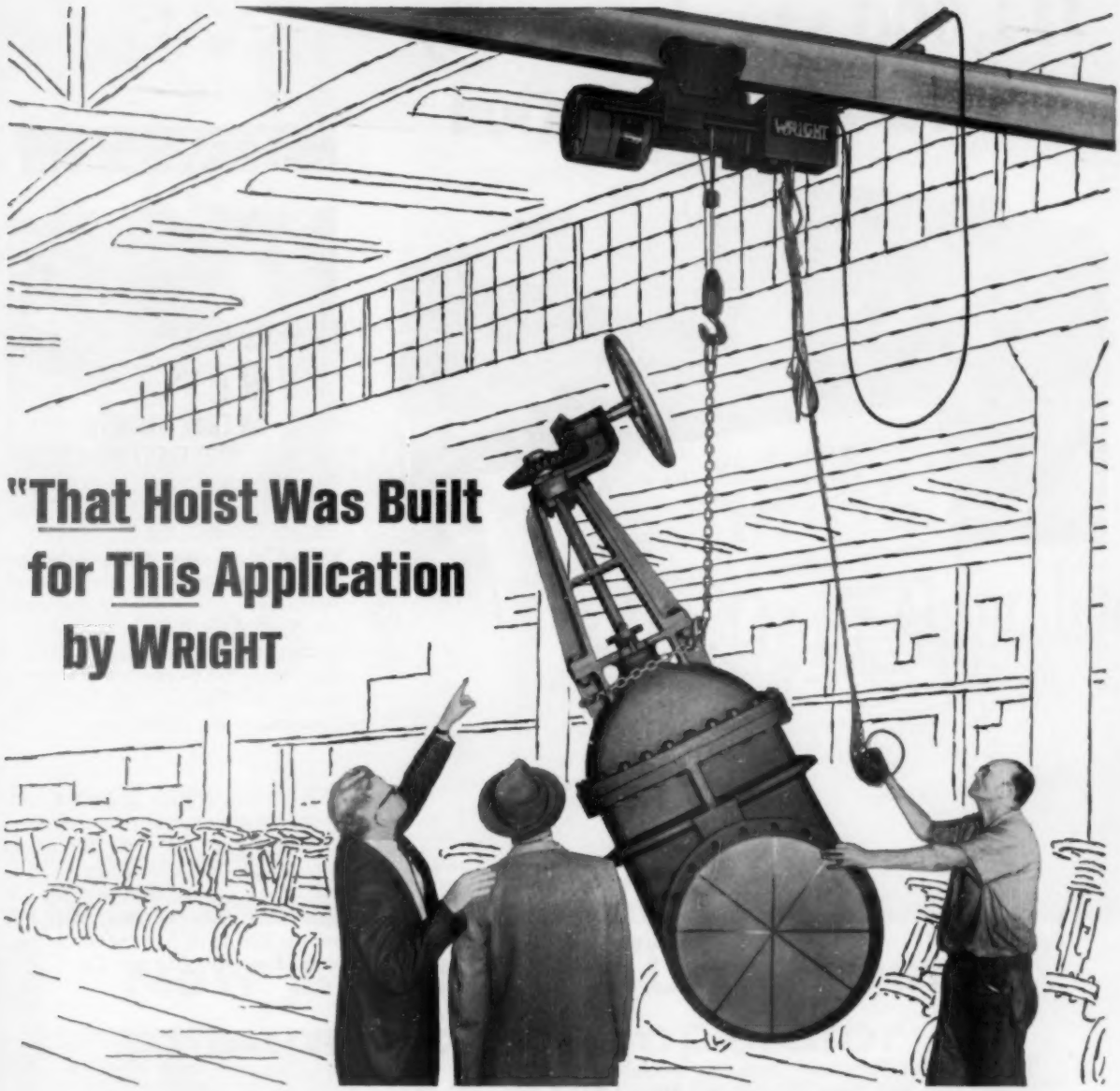
MAGNA-THOUGHT

Keeping step with the growth of American and world-wide industry, Eriez continues to improve and expand its magnetic separation equipment to meet the challenges of new processes and increased production volumes.

R. A. WHITE
Product Mgr.,
Separation Div.

ERIEZ

A GROWTH COMPANY . . .
10 NEW PRODUCTS IN THE LAST 5 YEARS



"That Hoist Was Built for This Application by WRIGHT

"This new W-1 Electric Hoist can be built to your exact job requirements. You can get it in capacities from 1 to 3 tons. For close headroom, ask for WH-1, in capacities 1 to 2 tons.

"Wright's overload cut-off can be had on both models. It gives you 3-way protection of operator, load and hoist. Our hoists are factory tested at 50% above rated capacity before overload cut-off is installed.

"These are the hoists to buy for handling efficiency, low maintenance cost, long service life."

STRONG W-1 SPEEDWAY FEATURES

- **MOTORS**—Fully enclosed, ball bearing type. Built to NEMA specifications and rated on basis of 30-minute duty cycle.
- **BEARINGS**—Anti-friction, precision ball or roller bearings support both ends of all shafts. They are mounted in splash oil lubricated gear chamber.
- **MOTOR BRAKE**—External expanding jaw, self-adjusting cam type; operated by solenoid.
- **DRUM**—Fabricated all-steel construction with liberal drum to cable diameter ratio to reduce wear and cable fatigue.

In Canada: **UPTON, BRADEEN & JAMES LTD., Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Vancouver**

See your ***WRIGHT distributor*** for complete information about the W-1 or write us at York, Pa.

WRIGHT HOISTS

Wright Hoist Division • American Chain & Cable Company, Inc.

York, Pa., Atlanta, Chicago (Melrose Park), Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

ACCO

For more facts Circle 484 on Reader Service Card

$11,000 saved annually with ADT protection

LAMMERT FURNITURE COMPANY
911-915-919 WASHINGTON AVENUE
SAINT LOUIS

American District Telegraph Co.:

Gentlemen:

Our warehouse has been protected by ADT Sprinkler Supervisory and Waterflow Alarm for many years and as a result several incipient fires have been prevented.

Upon moving into our 260,000 square foot, one-story warehouse we added the ADT Burglar Alarm System and this has eliminated other expense making a net savings to us of $11,000 per year.

We recommend the ADT service very highly.

Yours truly,

LAMMERT FURNITURE COMPANY

JAM:js

John A. Morrow

John A. Morrow
Purchasing Agent

The Lammert Furniture Company is celebrating its 100th anniversary this year. One of the largest family-owned furniture stores in the country, Lammert's has flourished through three generations and has expanded to five locations, including the new warehouse pictured above.

Thousands of other successful firms from coast to coast rely upon ADT automatic protection services to protect their property, their employees and their profits. Like Lammert's they benefit by uninterrupted continuity of business and in most cases enjoy actual dollar savings.

If your property is not automatically protected, you owe it to yourself to find out what ADT can do for you. Chances are that you can have far greater security and save money, too! Call an ADT security specialist. He's listed in your telephone directory.

AMERICAN DISTRICT TELEGRAPH COMPANY
Executive Office: 155 Sixth Avenue, New York 13, N. Y.
A NATIONWIDE ORGANIZATION

ADT

Begins on page 122

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

151—Cut-off saw and grinder accurately cuts carbon, stainless steel, and alloys without clamping or coolant. Special tooth shape of saw produces semi-milling action rather than biting and chipping. Result is nearly burr-free cut with no bluing. *Production Machinery, Inc.*

152—Power system protector continuously monitors 3-phase circuits. When voltage unbalance or phase reversal develops, transistorized circuit triggers relay. Sensitivity is adjustable. Resets automatically. For use on 220 to 575 v., 60-cycle systems. *Emerson Electric Co.*

153—Portable dispenser fills equipment too large or heavy to move to stationary-type unit. Handles pitch, asphalt, waxes, thermoplastics in 150 to 550 F. range. Special element applies heat to bottom and 75% of side walls. In 2-qt. to 50-gal. sizes. *Sta-Warm Electric Co.*

Turn the page

Introducing the

New STANLEY Low-Cost pneumatic door operator

- **LOW INITIAL COST**—less than any other automatic door equipment with complete control of door at all times.
- **LOW OPERATING COST**—pneumatically powered directly from your regular plant air lines.
- **LOW MAINTENANCE COST**—simplified design and construction virtually eliminate maintenance.

The STANLEY MAGIC-DOOR (LCP) Operator will mean increased production as materials move faster and more efficiently. Automatic door opening and closing will cut down congestion and reduce damage to doors, equipment, and materials caused by "battering" and spillage. Stanley's Low-Cost Pneumatic Operator also answers the need for controlled isolation of departments, conserves costly warm and cool conditioned air, and helps maintain specific humidity and temperature requirements.

LCP MAGIC-DOOR Operator is easily installed on single sliding doors up to 6 feet in width and 300 pounds in weight. Full-cycle power gives positive control throughout opening and closing action. Operating speed is easily adjustable. It can be activated by push button, pull cord, kick plate, floor plate or photoelectric controls.

See your local STANLEY MAGIC-DOOR Distributor for details on the new, Low-Cost Pneumatic Operator, or write to: Stanley Hardware, Division of The Stanley Works, MAGIC-DOOR SALES, Dept. I, 12 Lake St., New Britain Connecticut. Sales, installation and service distributors in principal cities in the United States and Canada.

STANLEY

REG. U. S. PAT. OFF.

AMERICA BUILDS BETTER AND LIVES BETTER WITH STANLEY

This famous trademark distinguishes over 20,000 quality products of The Stanley Works, New Britain, Conn.—hand tools • power tools • builders hardware • industrial hardware • drapery hardware • automatic door controls • aluminum windows • stampings • springs • coatings • strip steel • steel strapping—made in 24 plants in the United States, Canada, England and Germany.

CANADIAN PLANTS: HAMILTON, ONTARIO AND ROXTON POND, P.Q.

SERIES "23" "LOCKWELD" double ball race casters. Sizes 3-8 inches. Matching rigids available.

ALL CASTERS ALIKE?

SERIES "21" "LOCKWELD" single ball race casters. Sizes 2-6 inches.

Fairbanks "LOCKWELD" Steel Swivel Casters are the different casters—the casters without a king-pin—the casters without the major cause of caster failures. The unique "LOCKWELD" Construction will cut your maintenance and replacement costs—bring big savings to you.

Fairbanks patented "LOCKWELD" Steel Casters — in single ball race, regular duty, and double ball race, medium-heavy duty construction — have substituted a rugged welded structure for the king-pin assembly. Inherently stronger, and locking the ball raceways in rigid alignment, this construction provides casters that last longer, swivel easier, and end your swivel caster maintenance problems.

Another patented feature of Fairbanks "LOCKWELD" Steel Casters is the spherical leg design. Based on the stress dispersing qualities of a true sphere, this leg design disperses shocks and overloads over a greater portion of the ball race, providing for easier swiveling under load and materially increasing the strength and service life of the casters.

Buy Through Distributors. Fairbanks products are stocked, sold and recommended by leading distributors in all the principal cities across the nation.

THE **Fairbanks** COMPANY

Executive Office: 393 Lafayette St., New York 3, N. Y.
Valves • Dart Unions • Casters • Trucks • Wheels
520 Atlantic Ave., Boston 10, Mass.
2600 S. Throop St., Chicago 8, Ill.
393 Lafayette St., New York 3, N. Y.
15 Stanwix St., Pittsburgh 22, Pa.
202 Division St., Rome, Ga.
Factories — Binghamton, N. Y. and Rome, Ga.

These exclusive "LOCKWELD" Casters are part of the Fairbanks line of industrial casters and wheels which includes heavy duty, completely hardened, steel casters; trailer casters and semi-steel casters; Fairbanks guaranteed vulcanized rubber tired wheels; Fairbanks "LAMILON" All-Plastic (patent pending) wheels and solid rubber and semi-steel wheels.

SERIES "27"

Heavy Duty, completely hardened casters, sizes 6, 8 and 10 inch.

SERIES "500"

Guaranteed Vulcanized Rubber Tired Wheels, sizes 3-18 inches.

SERIES "700"

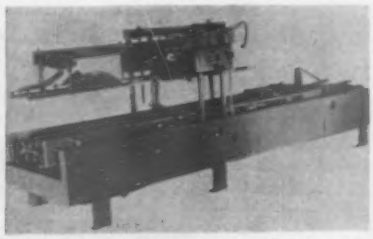
"LAMILON" All-Plastic (patent pending) Wheels, sizes 3-12 inches.

Begins on page 122

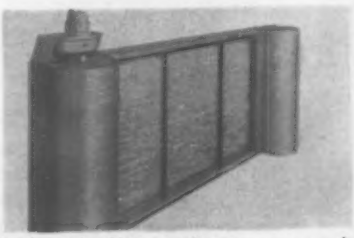
EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

154—Air nozzle with fingertip controlled valve uses air directly from line without need for pressure regulator. Safety valve stops flow when blockage causes over 1-psi. back pressure. Housings come in four colors coded for pressures to 50 psi. *Air-Lok Engineering Co.*



155—Case gluer applies glue in uniform strips which set faster and are as strong as coatings. Reduces glue consumption. Width and length of strip is pre-set and timing is automatic. Spatterproof—no clean-up problem. Eliminates glue pots, rollers. *Emhart Mfg. Co.*



156—Air filter, roll-type, comes in 84 sizes with automatic or manual drive. Covers are optional on ends of filter roll. Few moving parts, simple loading method. Can be installed in various positions regardless of air flow. Fits latest air-handling units. *Farr Co.*

Turn the page

Six ways your company can cut materials handling costs with NVF Kennett Containers

Today you may be buying materials handling containers made of wood, metal, plastic, cardboard or canvas—at a price that looks like a real saving. But you may be paying *more* in terms of container life and performance. Check these six important cost-cutting features of NVF Kennett Containers made of tough Vulcanized Fibre, and write for complete facts:

Long Life. Kennetts are durable, take the slam-bang of plant operations for years. Replacement cost is nil.

Easier Handling. Kennetts are lightweight. Women handle them easily. Productivity increases.

Less Plant Noise. Kennetts reduce tension-building clatter. Contribute to more efficient plant operation.

Safety. Kennetts are snag-free. Won't chip, peel, splinter, rot or rust. Protect contents, hands, clothing.

Custom Design. Kennetts can be fitted to exact dimensions of your needs. Standard construction in any size or color.

Fire Protection. Kennetts are available in a special fire-resistant grade of fibre: check fire, reduce hazard.

■ Write now for *free*, full-line catalog, or check Sweet's Plant Engineering File 1h/Na for the NVF Sales Office near you. National Vulcanized Fibre Company, Dept. KK, Wilmington 99, Delaware.

NVF

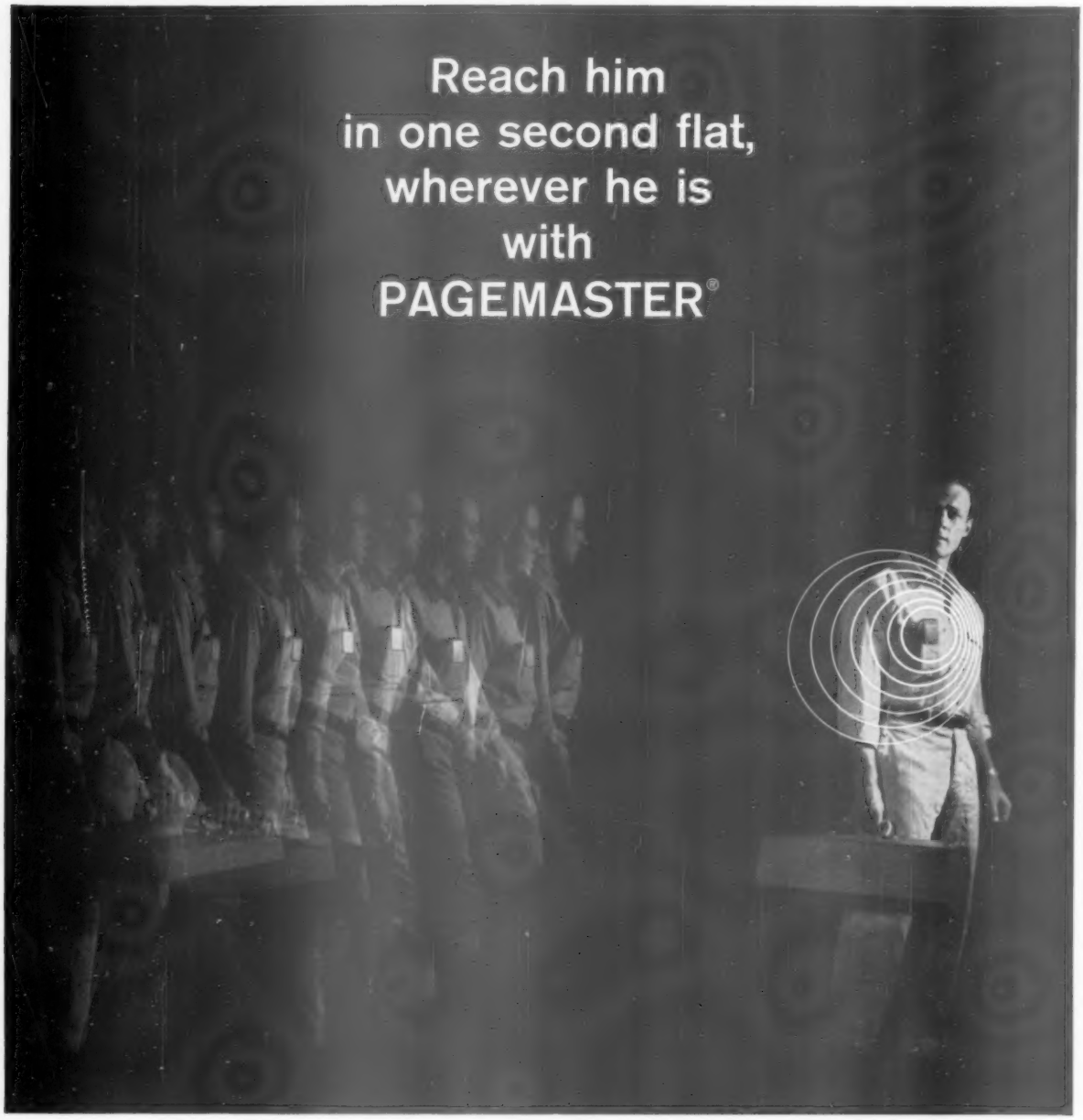
NATIONAL VULCANIZED FIBRE COMPANY
KENNETT DIVISION, Wilmington, Del. • FISHER DIVISION, Hartwell, Ga.
In Canada: NATIONAL FIBRE CO. OF CANADA, LTD., Toronto 3, Ontario

NVF Trays are easily handled.

Reusable Shippers protect instruments.

NVF Receptacles are rugged.

NVF Trays fit into systems.



Find him instantly—in the cafeteria, in the plant, even out of doors—way beyond the range of conventional paging systems.

Alert him—and only him. His—and only his—pocket-sized PAGEMASTER will beep discreetly. And will sound, again and again until he checks in. For PAGEMASTER is gentle but insistent.

What equipment do you need for a PAGEMASTER Selective Wireless Paging System? Nothing more than a desk-top encoder, a transmitter, an antenna, and transistorized, feather-weight receivers. Installation is immediate and inexpensive—no costly lights, loops or speakers are needed, no expensive drawn-out structural modifications are involved. And you can add receivers—up to several hundred—as your paging applications increase.

Want to see how much faster and how much more economically PAGEMASTER reaches key people . . . to help them get things done? Your STROMBERG-CARLSON® Communications Consultant has the irrefutable facts. For his name, call Western Union Operator 25, or write:

Commercial Products Division—Box F
1409 North Goodman Street
Rochester 1, New York

GENERAL DYNAMICS | ELECTRONICS

In modern business communications...THERE IS NOTHING FINER THAN A STROMBERG-CARLSON®

For more facts circle 489 on Reader Service card

Begins on page 122

EQUIPMENT NEWS

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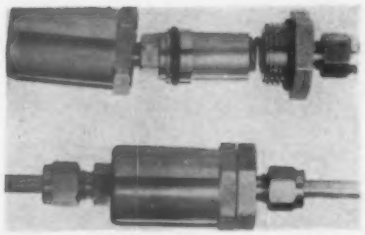
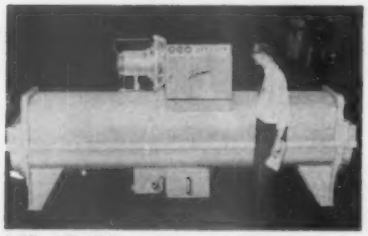


157—Fluid line filter has element which is replaceable without removing entire unit from system. Minimizes downtime to replace element. Filters contaminants from instrument air, fluid control, and coolant systems. In various micron-size elements. *Nuclear Products Co.*

158—Pocket-size two-way radio has automatic noise limiter and enough volume for noisy areas. Weighs only 23 oz.; has 12 transistors. Variable squelch control allows silent standby operation. Companion shirt-pocket pager has self-contained antenna. *Ross Laboratories, Inc.*

159—Variable speed drive uses electronic control. Needs no motor generator d-c source. Holds d-c motor speeds to within 0.5 to 2% of set speed; custom models to within 0.1%. For use in processing, machine tool and specialized automated machinery. *Tenney Engineering.*



160—Refrigeration machine comes in compact package—fits through 36-in. doorway. Needs little space, few supporting structures. Liquid-refrigerant-cooled motor drives compressor at 18,000 rpm.; dissipates its own heat. In 8 sizes from 50 to 100 tons. *American-Standard.*

Turn the page

Shepard Niles Hoists:
JOB-MATED
for Greater SAFETY

Shepard Niles

Explosion-Proof Hoist

In load-lifting and moving operations, the difference between costly accidents and dependable, hazard-free performance lies in quality equipment.

Shepard Niles JOB-MATED Hoists provide superior performance . . . minimum wear and maintenance . . . and extended service life, because we specify the ideal combination of quality components to meet exact on-the-job conditions. Care like this in our plant means greater safety for personnel and equipment in yours.

Shepard Niles offers you a JOB-MATED Hoist for every application. Choose from vapor-proof and explosion-proof models . . . ¼-ton to 30-ton capacities . . . with the new Shepard Niles Safety Hook and Traveling Pushbutton Pendant as added safety features. For further information, write for descriptive bulletin. Ask to have a Shepard Niles representative call.

America's Most Complete Line of Cranes and Hoists

Member of Hoist Manufacturers Association, Inc.

SHEPARD NILES
CRANE AND HOIST CORPORATION

3370 Schuyler Ave., Montour Falls, N.Y.

For more facts Circle 490 on Reader Service Card

NOW···GLOBE OFFERS···
two new INTERCHANGEABLE trays for support of cables, wiring and tubing

★ Engineered for uniform design and easy installation
★ Steel or aluminum construction
★ Complete accessories for SPEEDIER Installation
★ No sharp edges to damage cables
★ Complete interchangeability

Now, for the first time, two types of cable trays, one a ladder type and the other a basket type, are available to be used INTERCHANGEABLY at any given location, depending on the type and weight of the cables to be suspended. The advantages of each type tray can thus be used to the fullest extent. Globetray, the ladder type, is intended for use where festooning is not a problem, while Cable-Strut, the basket type, is intended for the support of communication wire, instrument tubing and control cables in automation applications.

These two cable trays have been thoroughly field tested in hundreds of large industrial installations, in new plant construction, in power plants, in modernization, and for power distribution in all types of manufacturing processes. A new catalog, just off the press, gives full information and installation techniques. Ask for your FREE copy today.

Distributors are to be found in all principal cities—consult the yellow pages in your phone book under "Gratings" or "Conduits" for the one nearest you.

109

PRODUCTS DIVISION

The **GLOBE** *Company* MANUFACTURERS SINCE 1914

4014 SOUTH PRINCETON AVENUE, CHICAGO 9, ILLINOIS

Begins on page 122

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

161—Small parts feeder has divided track which is adjustable in width. Two models, 6 and 10 in. wide, have 150- and 700-cu.-in. storage capacities due to mounting of drum on horizontal axis. Neoprene vanes move parts gently. Air- or motor-driven. *Dixon Automatic Tool, Inc.*

162—Safety ladder, with glass-fiber rails and aluminum rungs, is nonconductive for use in electrical areas. Rungs cannot turn, pull out, or collapse. Resists moisture, chemicals, acids. Rubber non-skid feet. Lightweight; straight or extension type. *Louisville Ladder Co.*

163—Portable optical gauge is low-cost precision instrument for direct measurement of parts without gauge blocks or master set-ups. Accurate to 25 millionths of an inch; measures to tenths. Operates without adjustments in 50 to 90 F. temperatures. *Bausch & Lomb, Inc.*

Turn the page

Now this sander is second best...

HERE IS THE NEW CHAMP

The old Aro 7025 Vertical Sander was industry's favorite for years. Nothing could touch it for speed, power, reliability.

That's all changed, now. The old 7025 has slipped to second best.

The new champ is the ALL-NEW ARO 7025 Vertical Sander. A completely re-designed job that brings you new Aro engineering advancements, new Aro concepts in lightweight, compact design.

Some of the advantages you can expect in the NEW Aro 7025 are . . .

- TWICE THE POWER
- DIRECT-DRIVE
- MORE SPEED
- LIGHT IN WEIGHT — 5 LBS.
- EASIER HANDLING
- NEW SAFETY GOVERNOR
- QUIET EXHAUST

ARO®

AIR TOOLS

THE ARO EQUIPMENT CORPORATION
INDUSTRIAL DIVISION · BRYAN, OHIO

Aro of California, 3141 S. Grand Ave., Los Angeles 7
Aro Equipment of Canada Ltd., Rexdale (Toronto) Ont.
Offices in Principal Cities

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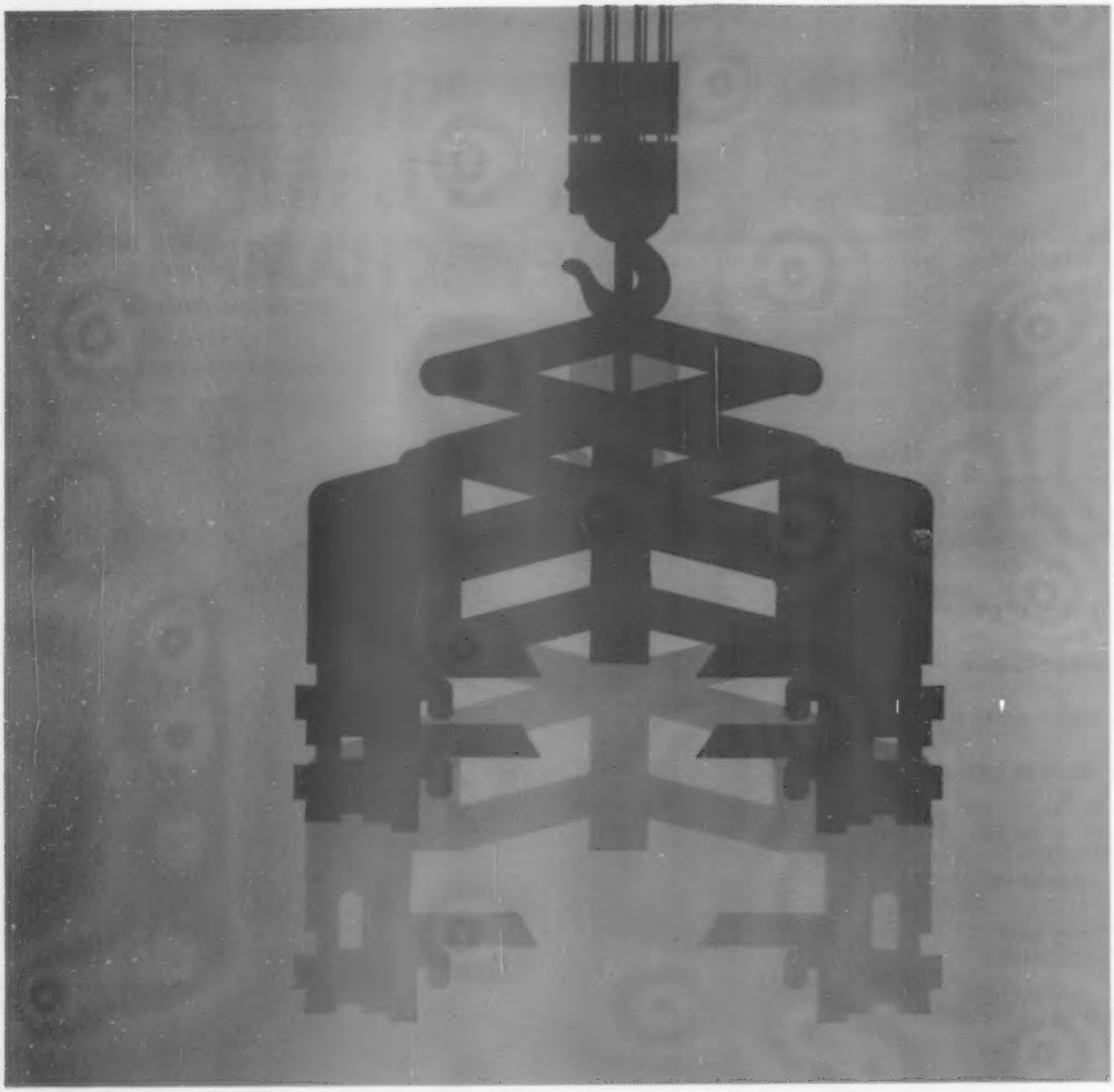

Slab Lifting Tongs

Pallet Type "C" Hook

Arbor Lifting Tongs

Safely · quickly · efficiently
Heppenstall can handle it

Applications for Heppenstall Tongs range all the way from warehouse use to special conveyor line needs. And the loads include square and rectangular shapes, coils, circular objects, and stacks of sheets. This full-line advantage is only part of the story. Special designs bring safety, speed and economy to your handling needs.

Our capabilities in tong design are available to you. Let us know *your* specifications. Write or call direct.

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Plants: Pittsburgh & New Brighton, Pa. • Bridgeport, Conn.

MIDVALE-HEPPENSTALL COMPANY
NICETOWN, PHILADELPHIA 40, PA.

H
M H

For more facts Circle 493 on Reader Service Card

FACTORY

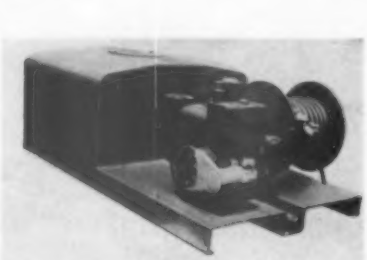
Begins on page 122

EQUIPMENT NEWS

For more data, circle item numbers you want on Reader Service Card.

164—Mobile conveyor lubricator services up to 100 miles of a running conveyor with one filling of lube. Maintenance men no longer need climb to lubricate trolley fittings. Retracts to prevent damage in case of broken trolley wheels. Air powered. *Aro Equipment Corp.*

165—Autotransformer, 30 amp., provides continuous, manual control of a-c voltage from 0 to 17% above input line voltage. Withstands momentary overload of 1000%. Uncased or totally enclosed types for back-of-panel, wall or bench mounting. For 120 or 240 v. *General Radio Co.*



166—Water pumper, 200-gal. capacity, is completely self-contained fire-fighting unit that can be loaded on small truck. Can be taken quickly to fires inaccessible to larger equipment. Projects 85-ft. stream at 100-lb. pressure for 11-min. operation. *Fire Equipment, Inc.*

TILE-COTE

The Practical EPOXY!

TILE-COTE Activated Epoxy Coating provides an odorless, non-toxic protective film of extreme permanence and durability -- possessing a hardness approaching that of glazed ceramic tile — in a practical MIM* finish which . . .

- **MIXES EASILY** — a simple blend of distinctly packaged components
- **KEEPS A WET EDGE** — for extreme ease of brushing (sprays beautifully, too!)
- **CONTAINS MORE EPOXY RESIN** — a full *consistent* measure in every color.

Amide-cured TILE-COTE -- available in clear and 10 bright colors provides reliable *practical* protection against

Acids	Water (fresh or salt)	Steam
Alkalis	Petroleum (crude or refined)	Sewage

***MINIMUM-INTERRUPTION-MAINTENANCE** — the concept of specialized coatings which perform unusual services *quickly*, with minimum shut-down of plant operation.
Write for Bulletin P-57 with full data.

Creators of Advanced Coatings for Industry

THE WILBUR & WILLIAMS CO., INC.

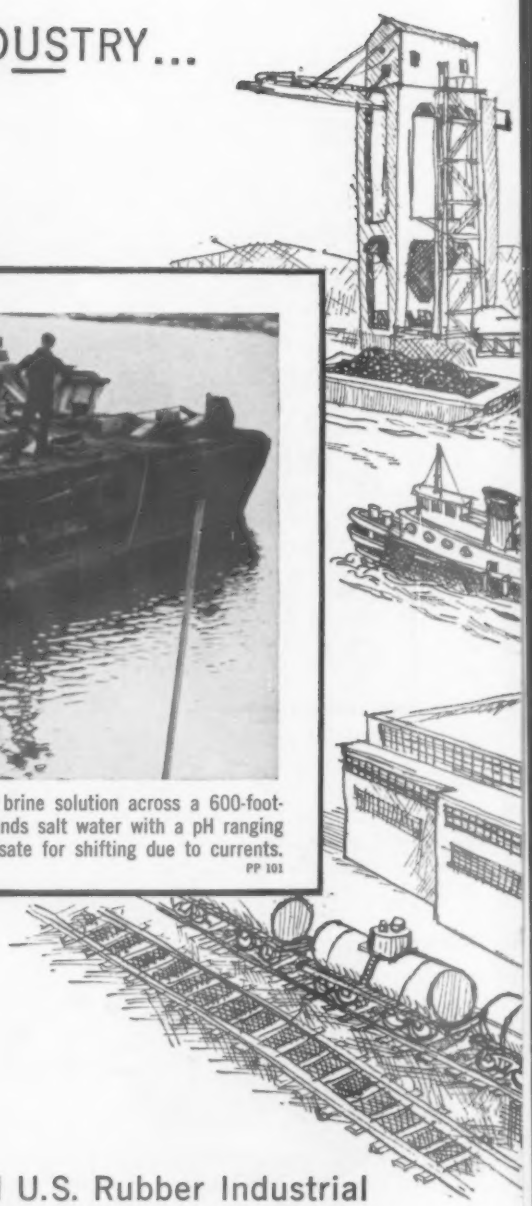
Factory and General Offices, 651 Pleasant St., Norwood, Mass.
In Canada — 7920 16th Ave., Ville St. Michel, Montreal 38, P.Q.

See us at Booth 321, Plant Maintenance & Engineering Show, Chicago.

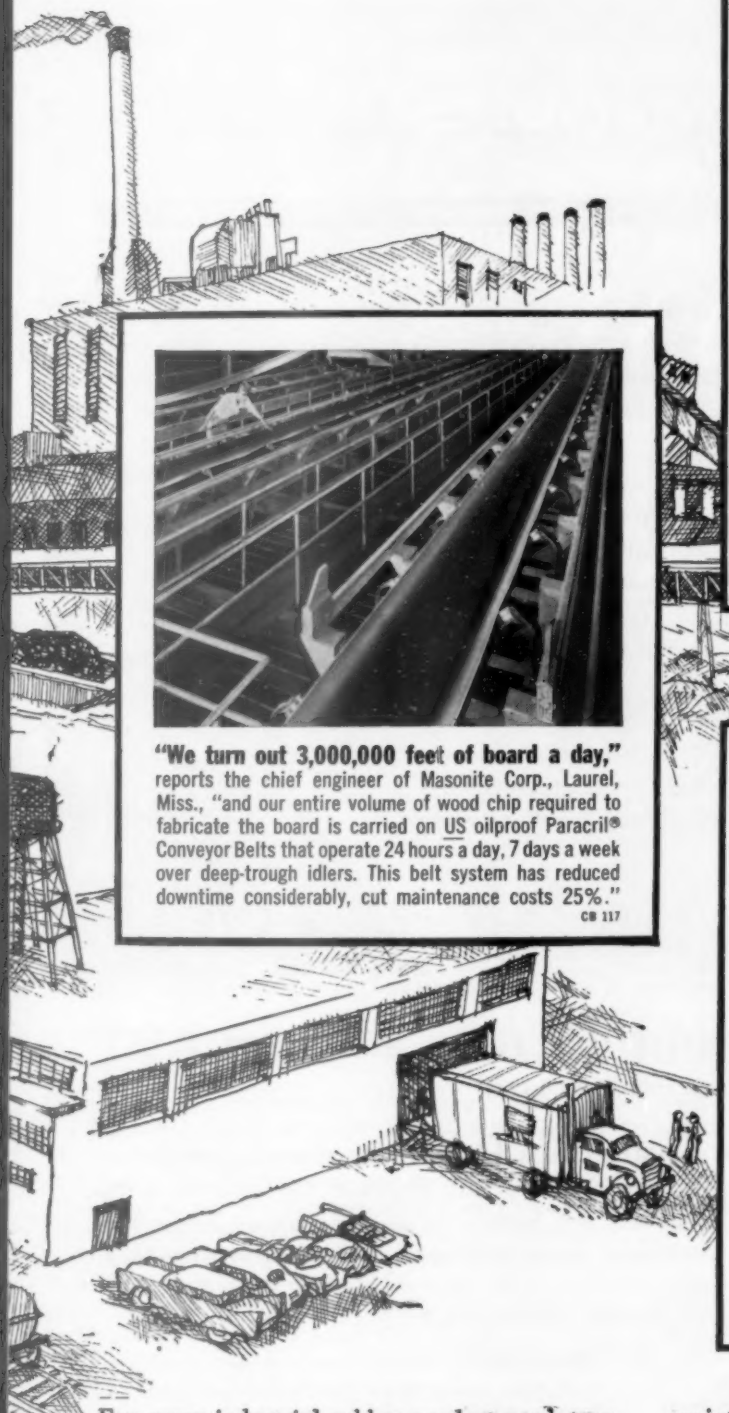
For more facts Circle 494 on Reader Service Card

US AT THE HEART OF INDUSTRY...

Underwater, underground, this U. S. Pilot® Pipe loves its salt diet—moves brine solution across a 600-foot-wide river economically and efficiently. Unlike metal pipe, U.S. Pilot Pipe withstands salt water with a pH ranging from 2.8 to 3.5, is flexible enough to follow the river bottom's contour, compensate for shifting due to currents.
PP 101



Wherever industry operates, you'll find U.S. Rubber Industrial Rubber Products helping it to function more efficiently...more profitably. As the world's largest producer of Industrial Rubber Products, US not only is aware of industry's requirements, but has the products to fill them.



"We turn out 3,000,000 feet of board a day," reports the chief engineer of Masonite Corp., Laurel, Miss., "and our entire volume of wood chip required to fabricate the board is carried on US oilproof Paracril® Conveyor Belts that operate 24 hours a day, 7 days a week over deep-trough idlers. This belt system has reduced downtime considerably, cut maintenance costs 25%."

CB 117

Complete security—because this man's working next to the hose that death-causing steam cannot burst: U.S. Matchless® Steam. This hose has a built-in safety device. When it's ready for replacement, the wire-braid construction prevents it from bursting. Instead, just a wisp of steam seeps through, letting you know it's time for a new hose.

M 109

Helping to create a revolution in wire-drawing, heavy-duty U.S. PowerGrip "Timing"® Belts are now used exclusively on machines made by the Whitacre Corporation of Los Angeles. Their positive, compact, maintenance-free driving power has enabled Whitacre to not only increase efficiency greatly, but to lower cost of the equipment at the same time. These belts are still operating after years of 24-hour-a-day service.

TB 101

For every industrial rubber product need, turn to US. For Conveyor Belts, V-Belts, the original PowerGrip "Timing"® Belt, Flexible Couplings, Mountings, Fenders, Hose and Packings . . . custom-designed rubber products of every description. Discover why U.S. Rubber has become the largest developer and producer of industrial rubber products in the world. See your U.S. Rubber Distributor or contact US directly at Rockefeller Center, New York 20, N. Y.

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

United States Rubber

MECHANICAL GOODS DIVISION

For more facts Circle 495 on Reader Service Card

IDEAS OF THE MONTH

By Lewis K. Urquhart, Consulting Editor, FACTORY

For more data, circle item numbers on Reader Service Card next to back cover.

Companies with complex projects that extend over several months, depend on timely completion of many sub-projects, can get kind of help they need from new computer service (*IBM*) that employs PERT (project evaluation and review technique) and CPS (critical path scheduling). **(236)**

Pallet users will find much useful info in "Specifications for Douglas Fir & Western Softwood Plywood Pallets" (NWPMA). Written for quick comparison of differences in quality of "custom" and "industrial" grades. **(237)**

Before you recommend home study to employees, why not consult directory of accredited schools (*National Home Study Council*)? **(238)**

Treat your secretary to Adjust-A-Matic (*Remington Rand*). It's newest thing in chairs. Seat is split into equal halves! Each half is mounted on universal joint with large foam-rubber block around it. Result: Each half responds to shifts in weight or movement of two "halves" of body. Payoff: pleasant, mobile freedom that combats fatigue. **(239)**

Why mercury lamps? You'll find satisfying answers—long life, low maintenance, low price—in new booklet (*Westinghouse*) which also contains helpful list of various types of lamps plus photos and ordering designations. **(240)**

For rainy-day protection of reception room carpeting, try disposable creped-paper runners (*Jordan*). They come in 1000-ft. rolls. **(241)**

Compressor Evaluation Guide (*Worthington*) provides technique for evaluating competitive compressor proposals. It's based on scientific analysis of both compressor *and supplier*, in six major areas—compatibility, thermodynamics, mechanical design, installation, service, experience. **(242)**

Soundzorbers, in case you haven't heard, are flexible, wire-reinforced rubber sound and vibration eliminators (*General Rubber*) that take knocks out of air conditioning, heating, refrigeration piping. **(243)**

Need new filing system? Be sure to take a look at Unit Spacefinder (*Tab Products*). It's different. Illustrated brochure tells why. **(244)**

Mark Oct. 8-14 on your calendar. It's Fire Prevention Week. Sticker (*NFPA*) for workbenches, desks, tools, other plant spots, will serve as constant reminder to employees that "Fires close plants . . . cut pay days." **(245)**

Turn the page

TVA guards with Gilman Aluminum Paint

Important link in the fabulous TVA complex, the Watts Bar Dam controls the Tennessee River south of Knoxville — providing power, improved navigation and a 38,600-acre lake. To protect this public investment, TVA maintenance people coated all exposed metal with Gilman Aluminum Paint, made with Alcoa® Pigments by Gilman Paint & Varnish Co., Chattanooga, Tenn. There's the fresh gleam of aluminum everywhere — on gates, locks, spillway, bridge railings and inside the power house.

Lasting beauty and low maintenance make aluminum paint the outdoor choice of most maintenance men. Best protection on weather-exposed metal surfaces, a good aluminum paint like Gilman's is economical, has remarkable hiding power, and can be touched up without objectionable color contrast. And at night, reflective aluminum is highly visible — an important safety factor.

Alcoa does not make paint, but Alcoa Pigments are used in more aluminum paint than any other brand. These paints actually cost less, last longer, give utmost protection against heat, cold, sun, rain, smoke and fumes. For more information about all types of aluminum paints and coatings, please send the coupon.

ALCOA ALUMINUM

PIGMENTS, PASTES & POWDERS

For exciting drama watch "Alcoa Presents" every Tuesday evening — ABC-TV

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1750-J Alcoa Building, Pittsburgh 19, Pa.
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- ☐ *Painting With Aluminum*
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Alsrule is plastic plotter (*Technical Marketing Associates*) that converts plain sheets of paper into custom graphs. Twelve log cycles and three linear scales for direct plotting. Two charts—one linear, one logarithmic—provide infinity of precision-divided scales of varying moduli. **(246)**

TFM stands for trouble-free maintenance. And TFM (*Gulf*) is for operators of small or medium-sized truck fleets. It's a 72-page manual covering lubrication frequency, adjustment and tune-up, inspection procedures, record keeping, importance of selecting proper fuels and lubricants. **(247)**

Our enthusiasm for slotted angle (*Acme Steel*) which now comes in kits (Aug. FACTORY, page 155) was in nowise dampened by 8-page brochure that hit our desk today. And we don't think yours will be, either. It illustrates how this do-it-yourself framing material can be used in applications ranging from racks, mezzanines, platforms to material handling and packaging. **(248)**

Safety shop coat (*Can-Pro*) has tapered sleeves, angled pockets without dangerous flaps, no belt to catch in machinery. It's trimmed down for safety's sake, yet cut full for comfortable fit. **(249)**

One man and husky Hi-Jack (*Vermette Machine*) can lift 500-lb. loads up to 15 ft. at speed of about 3 fpm. New bulletin shows how. **(250)**

Booklet of the Month is 8-page "Plexiglas Replacement Window Glazing" (*Rohm & Haas*). It presents convincing list of advantages—breakage resistance, light weight, glare reduction, ultra-violet control, etc.—of acrylic plastic sheets as glazing material. Also included: how to install and clean. **(251)**

Like ice in your Coke? Well, now you can serve it that way in the plant. From a pre-mix vending machine (*Glasco*). With ice from an ice maker mounted on top. Produces 100 lb. of miniature cubes per day. **(252)**

Purchase . . . lease . . . rental? Which for you? If it's lift trucks you're wondering about, see 12-pager (*Automatic Transportation*) which discusses *why* and *when* of leasing, leasing problems and their solution, plans available, and how other companies have used them to increase profits. **(253)**

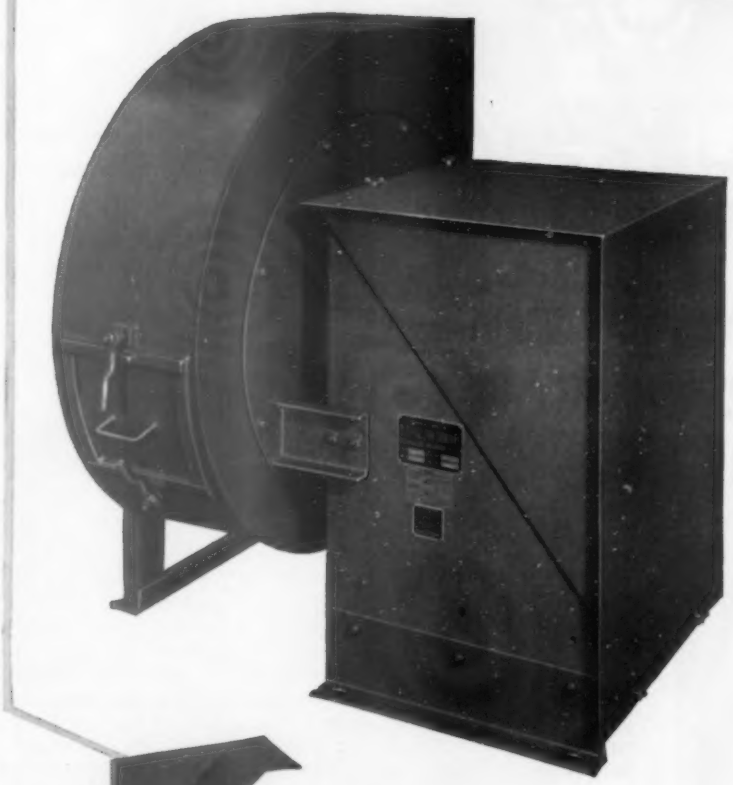
For fluid piping systems, nothing like self-sealing couplings. New 20-page bulletin (*Aeroquip*) describes basic applications, shows how they prevent system contamination, save time in making and breaking connections, prevent fluid leakage, avoid necessity for bleeding or refilling lines. **(254)**

Portable Executary is new dictation unit (*IBM*) that weighs only 6½ lb. Its transistors are powered by ordinary flashlight batteries. Belt holds 14 min. of dictation. PE may also be used for transcribing. **(255)**

Turn the page

CLARAGE

NEW...
Packaged INDUSTRIAL FANS



Ready-to-run

NOW the highly regarded Type XL industrial fans have joined the expanding family of Clarage self-contained, packaged units.

Hinged cover completely encloses motor, drive, and bearings for weatherproof installation outdoors or for added safety on indoor applications.

These compact, rugged, economical units are available with either the open type wheel for handling materials or the high efficiency backplate wheel for light dusts and fumes.

Contact the nearest Clarage sales engineering office for full information on this new line of equipment.

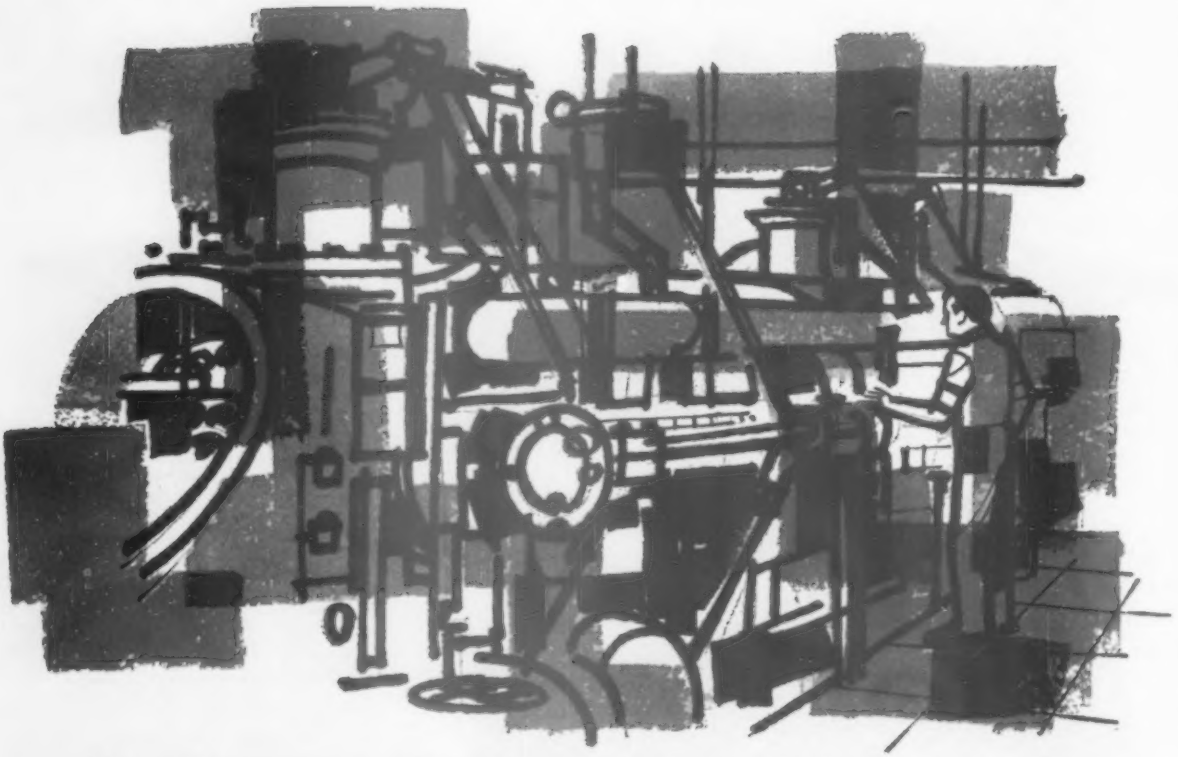
Dependable equipment for making air your servant

CLARAGE FAN COMPANY

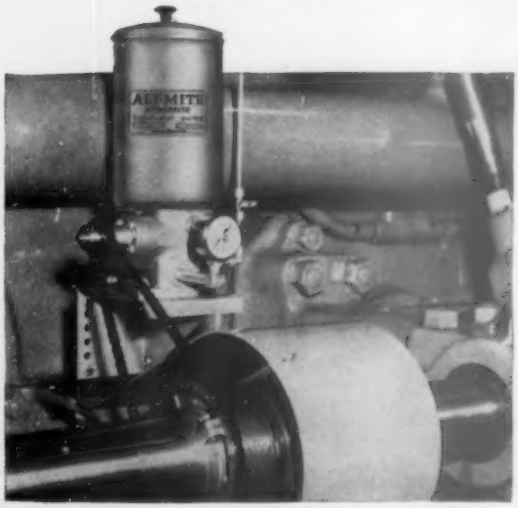
Kalamazoo, Michigan

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

For more facts Circle 497 on Reader Service Card



No other centralized lubrication system can offer the advantages of Accumite with the ALEMITE MECHANICAL PUMP AND TIMER!



Close-up of the Alemite Mechanical Pump and Timer driven by timing shaft by means of a chain and sprocket.

By utilizing a chain and sprocket to transfer rotary motion to an Alemite Mechanical Pump and Timer you can supply efficient, automatic Accumite Centralized Lubrication to as many as 400 points or bearings. That's over 30 times the capacity of other pumps! The Alemite Pump eliminates the "rat's nest" of lines other systems require—serves all bearings with a single line. Shots are measured at the bearing, *not at the pump*. Line length is no factor and any size shot from .00055 oz. to .012 oz. or more can be delivered to any point. Two more Alemite advantages are the big capacity 5-pint reservoir and an alarm system assuring accurate, positive lubrication.

The Alemite Pump and Timer is completely mechanical, uses no air or electricity. Cam operated valve closes at intervals determined by the pump input shaft speed to deliver positive, measured amounts of lubricant to each point in the system. Measurement is by piston stroke, wear not a factor, pressures remain constant and can be read on any type gauge.

Contact your local Alemite distributor or write for free illustrated literature on the Alemite Mechanical Pump and Timer and the Accumite Centralized Lubrication System.

Symbol of SW Excellence

ALEMITE DIVISION
STEWART-WARNER CORPORATION

Dept. B-91, 1850 Diversey Parkway, Chicago 14, Illinois

In Canada: Stewart-Warner Corporation of Canada, Ltd., Belleville, Ontario

For more data, circle item numbers on Reader Service Card next to back cover.

Rolamat is what the doctor ordered for safe, comfortable footing on hard concrete floors and in slippery areas. It's wood-slat floor mat (*American Mat*) that rolls like a carpet, lies flat as a pancake, is reversible, easily cleaned. Slats are chemically treated to resist rotting or warping. **(256)**

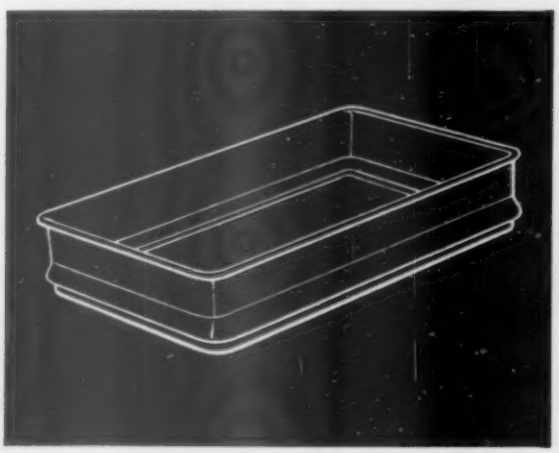
To file large blueprints, engineering drawings, Stikfile (*Dancer*) is steel cabinet with dowel system on sliding tracks. Binders hold 75 sheets of 20-lb. paper. Takes only seconds to add or remove sheets. **(257)**

Flying insects? Electric fogger (*Burgess Vibrocrafters*) delivers 2000 cu. ft. of killing fog from 1 oz. of insecticide—in 30 sec. **(258)**

Foolproof identification of closely allied materials (wire and rod, for instance) is no idle dream with inexpensive carbon-steel tags (*Broomall*). In 100 distinctive shapes recognizable at a glance. **(259)**

Suede-like surface of porcelain-enameled chalkboard (*Benjamin*) is easy to write on, has superior scratch resistance and erasing qualities. **(260)**

Turn the page



Let **wear-ever** keep it handy

Small parts can be expensive. That's why Wear-Ever's rectangular pans and transport boxes are all drawn seamless from one sheet of extra-tough, dent-resistant aluminum alloy. No seams to catch tiny parts or dirt. Easy-to-clean rounded corners, sanitary open bead. Send reply card for full details; or write Wear-Ever Aluminum, Inc., New Kensington, Pa. Count on immediate shipment from stock.

For more facts Circle 499 on Reader Service Card

IT'S ALL NEW AND READY FOR YOU

it's your NEW HANDY HELPER Shipping Room Supply Catalog

THIS HANDSOME "NEW" EDITION IS YOUR MODERN GUIDE TO BETTER SHIPPING METHODS AND SHIPPING ROOM SUPPLIES, INCLUDING THE ORIGINAL "ROL-IT-ON" ROLLER STENCIL PROCESS.

Clip this handy coupon or write on your letterhead

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P. O. BOX 269 HERRIN, ILLINOIS

Please Send Me a FREE COPY of "Your Handy Helper"

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Firm .....
Address .....
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For more data, circle item numbers on Reader Service Card next to back cover.

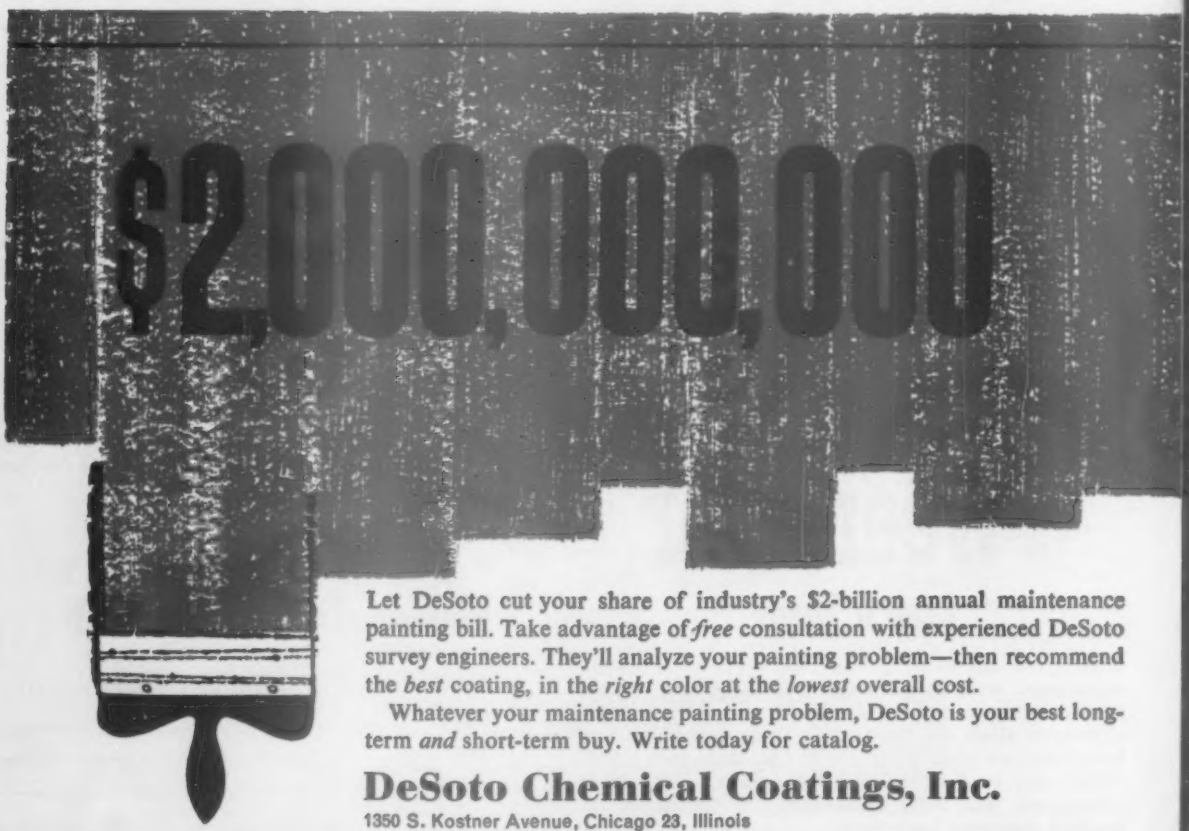
Non-fogging eye protection is sure thing with hinged-type plastic shield (*Mine Safety Appliances*) which may be attached to any safety hat or cap; flips into position when needed, pushes out of way when not. **(261)**

Flame cutter (*Air Reduction*) cuts straight or curved lines in metal plate without templates or skilled operators. For heavy industry. Maybe that means you. It's controlled by coded instructions on punched tape. **(262)**

Good news for nurses in small plants that don't want to invest in footmats to combat athlete's foot: Onox in squeeze bottles for home use. **(263)**

To keep dirt out of grease fittings, there's a one-piece polyurethane cover (*Lubrication Specialty*). Retainer ring stretches over fitting; strap hinge holds cover on fitting base during greasing operation; cap snaps over top of fitting. In bright colors for coding type of lubricant. **(264)**

Look, Ma, no hands! With Amplifone, that is. It's cordless, battery-powered transistorized telephone holder (*Bell Industries of Calif.*). You talk or listen with both hands free to make notes, look up information, etc. **(265)**



Let DeSoto cut your share of industry's $2-billion annual maintenance painting bill. Take advantage of *free* consultation with experienced DeSoto survey engineers. They'll analyze your painting problem—then recommend the *best* coating, in the *right* color at the *lowest* overall cost.

Whatever your maintenance painting problem, DeSoto is your best long-term *and* short-term buy. Write today for catalog.

DeSoto Chemical Coatings, Inc.

1350 S. Kostner Avenue, Chicago 23, Illinois

Now! Any old electric hammer is worth $60 or more trade-in

on a New Skil ROTO-HAMMER

...the hammer that revolutionized masonry drilling

Your Skil distributor is ready to give you a whopping big trade-in allowance on a new Skil Roto-Hammer—*the fastest, easiest, lowest cost way to drill masonry holes!* You'll actually receive $60 or more worth of Skil Hammer accessories as your trade-in for any old electric hammer, regardless of make, model or condition.

Two Roto-Hammer models are available —new, improved Model 726 (drills masonry holes from 11/64″ to 1½″ diameter); Model 736 (drills masonry holes from ½″ to 3½″ dia.).

See your Skil distributor NOW for complete information. *But hurry! This sensational trade-in offer is for a limited time only!* Look under "Tools—Electric" in the Yellow Pages. Or write: Skil Corporation, Dept. 1171, 5033 Elston Avenue, Chicago 30, Illinois.

SKIL POWER TOOLS

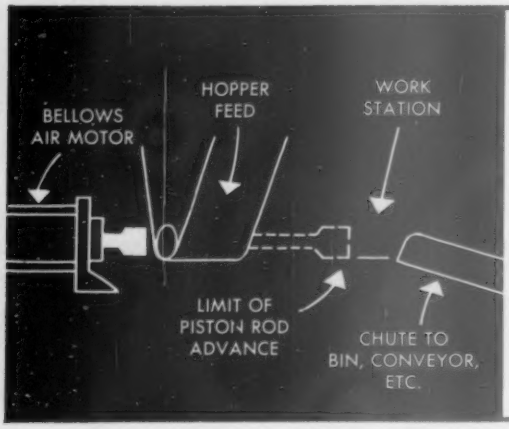
Only Skil Roto-Hammers have 3-way action

Hammers with automatic power rotation. For fastest, lowest cost masonry drilling without tedious hand rotation of star drills.
Hammers without rotation. For chiseling, channeling, slotting, demolition work, scores of hammering jobs.
Drills without hammering. For use same as a regular electric drill in boring wood, metal, other materials.

...and only Skil Roto-Hammers use 4 types of percussion-rotary bits...over 150 accessories in all for unequalled versatility!

ONE OF THESE INEXPENSIVE, SHOP-BUILT WORKFEEDERS CAN SAVE YOU HUNDREDS OF DOLLARS

Shown here are three ways you can use Bellows Air Motors® to feed and position workpieces more quickly, efficiently and at lower cost. They are typical of the many ways Bellows Air Motors are used in all types of industries.

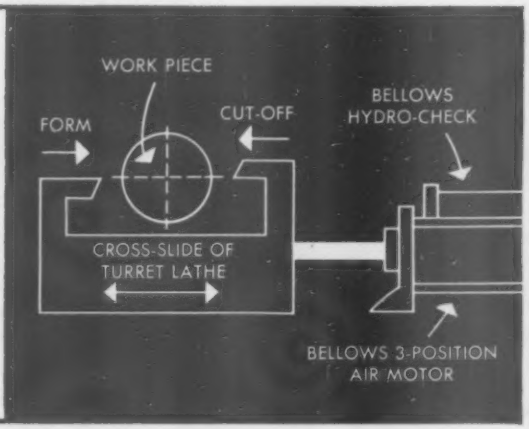


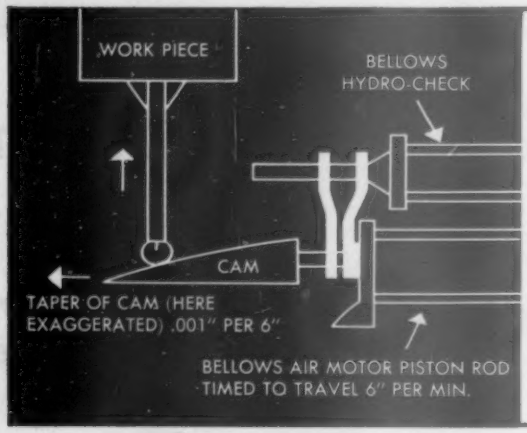
HORIZONTAL, STRAIGHT-LINE POSITIONING AND EJECTING

This extremely simple set-up is widely used in conjunction with hopper feeds in stamping and coining, sawing, drilling, deburring, inspection and similar operations. On its advance stroke, the piston rod of The Bellows Air Motor takes a workpiece from the hopper and moves it until, at full advance, the piece is properly positioned for the operation. The positioning of each workpiece serves to eject the preceding unit. Speed of advance and retract strokes is individually adjustable. The Air Motor can be set for either single cycle or continuous operation, and, when desired, is easily synchronized with a machine element.

FEEDING CROSS-SLIDE OF TURRET LATHE

The sketch at right shows a typical application of a Bellows 3-position Air Motor feeding the cross-slide of a turret lathe. Center, or "neutral," position of Air Motor piston rod is tool "at rest" position. Rod retracts to "form," advances to "cut-off." Using sequencing switches, the Air Motor's operation can be synchronized with the automatic turret to "form" at any point in turret's sequence, return to neutral until all other operations have been performed, then to advance to "cut-off." Speed of advance and retract strokes is independently adjustable. Incorporation of a Bellows Hydro-Check® provides accurate control of piston rod, complete freedom from "chatter."




WORK PIECE
BELLOWS HYDRO-CHECK
CAM
TAPER OF CAM (HERE EXAGGERATED) .001" PER 6"
BELLOWS AIR MOTOR PISTON ROD TIMED TO TRAVEL 6" PER MIN.

SLOW, ACCURATE FEED RATE

Slow and/or highly accurate feed rates—such as might be required by certain grinding and cut-off operations—can be achieved by advancing the work-holding fixture by the action of a roller moving on a tapered cam which is mounted on an Air Motor's piston rod. As shown in the sketch at left, for example, the cam has a taper (greatly exaggerated in the illustration) of .001" per 6" length. If the piston rod is timed to travel 6" per minute, the resulting feed rate of the workpiece is .001" per minute. Compound feed rates can be obtained by appropriate variations in the contour of the cam. Perfect smoothness and accurate control of Air Motor's piston rod is assured by use of a Bellows Hydro-Check.

807-C

THIS SPOT-A-MATION IDEA FILE IS YOURS ON REQUEST

Contains information on a variety of different parts feeders, as well as installation data, wiring diagrams and equipment lists for scores of other "Controlled-Air-Power" applications. Write for your free file . . . today! Address Dept. FA-961, Bellows-Valvair, Akron 9, Ohio.

Bellows-Valvair

Bellows-Valvair

AKRON 9, OHIO

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

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ENGINEERED PLANT SAVINGS

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FACTORY'S CASE BOOK OF

ENGINEERED PLANT SAVINGS

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No. 46 September 1961

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Unloading like lightning

Some 40,000 pounds of coffee can be unloaded from a truck, weighed, sampled, and coded for inventory in 12 to 15 minutes at J. A. Folger & Company, Portland, Ore. And one man can do it all with this four-stage conveyor system.

This used to be a tremendous job. The pallets had to be loaded one at a time and then weighed, sampled, and coded. Here's how the new system works:

Three gravity-roll bridges connect the truck's gravity rollers to the main unloading conveyor system (top photo). A pulling attachment connected by cleats to the outside of the conveyor moves the entire load of pallets from the truck at once.

The pallets accumulate on a section of gravity rollers leading to a scale conveyor. At this point, the 6-ft.-long conveyor takes over and automatically centers a single stack on the scale (bottom photo). During the weight recording, the operator

obtains a sample of the coffee and stencils the bags with a coded inventory number. A pushbutton advances the scale conveyor and the stack breaks a photoelectric beam of light which starts a storage conveyor on its way. When the stack reaches the head of this conveyor, it's picked up by a fork truck for transportation to storage.

The system, designed by Link-Belt Company, Chicago, can handle up to 63,000 pounds.

Conveyor carries away fire hazards

This 320-ft.-long conveyor gets rid of combustible material fast at Avon Products of Canada Ltd., Pointe Claire, Que. Though installation costs are relatively high, the conveyor can reduce plant insurance costs considerably.

Avon has installed 24-sq.-in. aluminum drop holes near the front of assembly lines in the packaging area. Of the 17 holes, 15 contain two-swing-flap 19½-in. openings through which rubbish is dropped to the conveyor below. The other two drop holes are fitted with caps.

The 24-in. rubber belt conveyor has a metal bottom and 2-ft.-high metal sides. It's powered by a 2-hp. motor, travels at 40 fpm., and empties into a 6x8-ft. incinerator. (It might help also to have a sprinkler system installed over the conveyor belt.)

The installation doubles as a fire escape hatch for basement personnel as shown in the photo. Two rungs have been riveted to the conveyor side, and the metal side wall collapses under the holes to form an escape ladder.

Walkie truck lifts in double time

A walkie truck with a special hinged adapter has solved a knotty material handling problem at Glaser Crandell Company, Chicago.

Heavy pallet and skid loads had to be moved around on upper floors of the four-story plant, but fork trucks were impractical there. An electric walkie truck would have met the weight requirements, but since most of them are designed only for pallet handling they haven't high enough lifts for skids. The food processing company uses both pallets with a 6-in. clearance and skids with a 10-in. clearance for loading its shipments.

A custom-built hinged skid adapter (Moto-Truc Company, Cleveland) attached to a walkie truck finally did the trick. The adapter, shaped like a bed frame, is raised manually to a vertical position (photo) when the truck handles pallets. The forks shown here are 3½ inches high and can lift 4 inches.

The skid adapter, when lowered into a horizontal position above the forks, forms a rigid frame. This adds sufficient height to the forks to lift the higher skids easily.

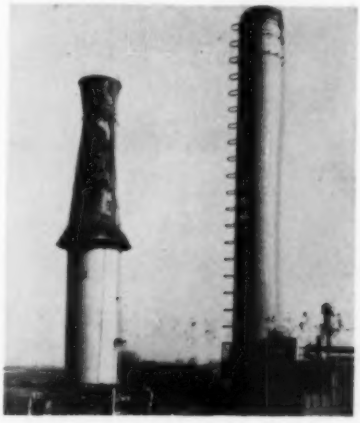
Rapid reading course gets message across

Rapid reading with good comprehension was felt to be a basic requirement for all management training courses at Kaiser Steel Corporation, Fontana, Calif. Kaiser wanted to raise the reading level of its plant management personnel from a low 300 words per minute all the way up to 1300 words.

Dissatisfied with commercially available films, which strive for a maximum of only 700 words, Kaiser developed its own course and a new technique. It departed from the standard method that sequentially exposes part lines. The course consists of 28 films, on each of which is a gray mask. The mask travels from the top of the screen to the bottom, covering up the reading matter line by line. This enables faster readers to speed ahead, and bars "read back."

These five-minute films take a class from 300 to 600 words per minute in 25-word steps, and then on to 1300 words in 50-word stages.

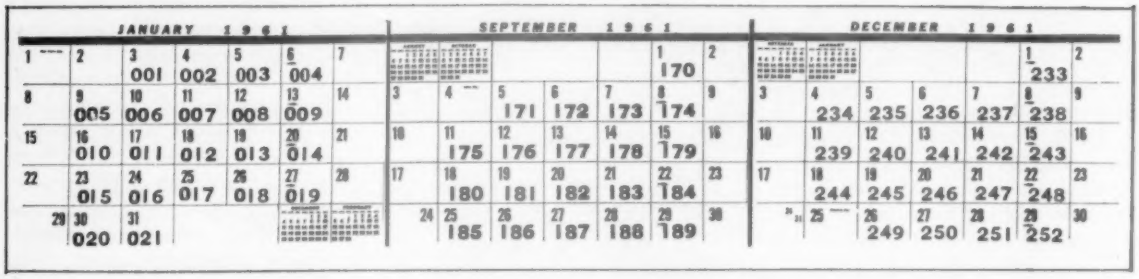
The home-made films provide another advantage. They include messages from company executives and articles relating to steelmaking. Thus, the management pupils gain two benefits from the course.



Burning off the cyanide problem

There's no detectable trace of cyanide in the exhaust stream of the incinerator at Oldsmobile Division of General Motors Corporation, Lansing, Mich. It has been completely burned off.

The incinerator system (Prenco Manufacturing Company, Royal Oak, Mich.) basically consists of a giant refractory-lined steel stack, a burner unit, storage tanks, hoppers, mixing vats, pumps, valves, and controls. Cyanide wastes are brought to the burner site, mixed with waste soluble oils, and burned off at high temperatures. Result is complete disposal of the wastes. And there's no danger of stream pollution since no public bodies of water are used.



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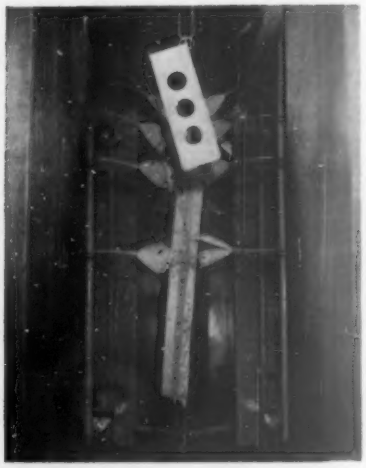
24	25	26 249	27 250	28 251	29 252	30

WORK-DAY CALENDAR SHOWS IT'S LATER THAN YOU THINK

No, the printer who produced this calendar wasn't coming off a weekend bender. It's an efficient industrial calendar used at Leeds & Northrup Company, North Wales, Pa. As far as production is concerned, 1961 has 252 not 365 days. The calendar is a tool in the hands of each department foreman. The numbers represent the actual number of work days in the year. Weekends and holidays are left blank. This means that a quick glance and simple subtraction will tell a foreman how much normal work time he has for a specific job. For example, if on Sept. 13 his department is assigned a job to be completed by Dec. 20, he just subtracts 177 from 246 to figure out his work days. Saturdays are reserved for emergency work.



Epoxy painting with no hand spraying

Parts are automatically painted with epoxy in this $300,000 flow-coating system at Boeing Airplane Company's Renton, Wash., plant. Epoxy could only be applied by hand spraying until the development of a formula last year boosted pot life from 8 to 100 hours.

Parts are hung on 6000 hooks suspended on an overhead monorail, 1000 feet long, moving at the rate of 10 fpm. After a drenching in a hot alkaline cleaning shower, parts are rinsed, deoxidized, and rinsed again. A yellow-brown chemical paint base is applied in the chemical conversion chamber followed by rinse, drying, and cooling. These steps are important to insure an adequate bonding surface for the epoxy.

In the coating chamber (photo) a battery of nozzles floods the parts with jets of epoxy. Unlike a conventional paint booth, the excess epoxy is not wasted. It drains off, is collected in a sump, cleaned and recirculated through the 30-gal. system.

The dryoff chamber is a vapor tunnel where a controlled atmosphere of epoxy solvent helps to determine coating depth. The concentration of vapors, together with the epoxy formula, sets the rate of coating runoff and thus the thickness of the coating.

The flow-through system can also be used to apply zinc chromate.

$100,000 in junk

The meaning of scrap is brought home to employees in language they understand at Thompson Products Division (Cleveland) of Thompson-Ramo-Wooldridge, Inc.

This scrap bin, mounted on a skid in the production area, is filled with $100,000 worth of spoilage. To emphasize its dollar value, the scrap is broken down into terms familiar to every worker. For example, the money wasted by 20 poorly made rotor blades would easily keep a family of six for a month.

The bin is moved around weekly to different shop areas. Its virtue as a conversation piece alone keeps quality paramount in the minds of the workers.

Air conditioner kicks out oil mist

A self-cleaning unit has permitted Fisher Governor Company, Marshalltown, Iowa, to air-condition its main manufacturing areas. This was impossible before because large amounts of oil vapors and dust from manufacturing processes would have clogged conventional equipment.

Now eight Rotaspray units (Carrier Corporation, Syracuse, N. Y.), each delivering 30,000 cubic feet of conditioned air per minute, are installed on the plant roof. They can either be placed on top of the roof or suspended from it.

As air containing the oil vapors is drawn into each unit, a virtual hurricane of spray water flushes out the oil and other foreign matter. The unit then cools and dehumidifies—or heats and humidifies—the air as it passes through. Finally, filtered air at the desired temperature and humidity is returned and circulated through the plant.

Japan looks toward maintenence

If you think managed maintenance is strictly an American phenomenon, Mr. Plant Manager, here's an eye-opener. Your counterpart in Japan is becoming increasingly aware of the importance of that function. And is becoming more and more sophisticated in his approach to maintenance problems.

FACTORY's news bureau in Japan visited five top plants in the Tokyo area to pinpoint some of the major problems and goals affecting maintenance. We found much that's similar to American industry in our survey of these plants:

1. Oil refinery (with international affiliations). Maintenance and warehouse function reports to plant manager through a coordination group over all department heads. Has practiced preventive maintenance (PM) since 1951. Maintenance workload runs 48% for shutdown repairs, 29% for annual shutdown, balance for other repairs and improvements. Company hopes to extend annual interval to 18 months, eventually to 24 and even 36 months through better PM techniques. Big target: On-stream inspection, not done now.

2. Electrical machinery (heavy and light). Biggest maintenance problem of this multi-plant company —one of Japan's largest—is that production is growing so fast "there's no time for inspections." About 75% of the modernization program is for new production equipment, 25% for renovation of existing machines. Maintenance heads can't seem to sell PM to production divisions. Diversified product, they say, gets in the way. No regular inspection schedules. No breakdown of cost of repairs. Machine maintenance gets priority over building repair. Yet the second man in the executive line-up is responsible directly to the factory manager for maintenance. When modernization is completed, the plant hopes to reverse its present maintenance cost record of 30% for routine repairs and 70% for breakdown repairs. Two other big problems: no blueprints or parts for new foreign-made machines; slow modernization of maintenance equipment.

3. Chemical process (U.S.A.-Japan partnership). Maintenance costs are running less than 5% of plant investment cost in this three-year-old plant. They're 2% of gross sales. Plant management considers this cost moderate, says its techniques are as good as any in this industry in Japan. Maintenance management's chief aim is to prevent breakdowns. Contract maintenance is used. Maintenance head has 15 men to plan jobs done by outside workers, and 31 men who keep the electrical plant going. He reports through the engineering division chief to the manager. Big problem is lack of skills of contractor's men. They are temporary in nature, get less pay than plant workers. Most work (80%) is done in two weeks during the annual shutdown. A regular inspection is made at semi-annual date, takes about two weeks.

4. Steel (special alloys). Capacity of 800,000 tons crude steel is being expanded to 1.9-million tons. New equipment is not being installed by maintenance. Maintenance chief is one of four department heads reporting to two assistant plant managers. Plant has an elaborate statistical accounting of maintenance costs. They run about 30% for breakdown repairs, 70% for PM (apparently considered "all else"). The PM share runs about 5% of manufacturing costs. Repair work is planned, but there is no work measurement—company expects to install this next year. Two big headaches: poor quality of maintenance workers; difficulties in changing from a highly decentralized system of maintenance to a centralized program. Maintenance head says other steel plants are working on same problems.

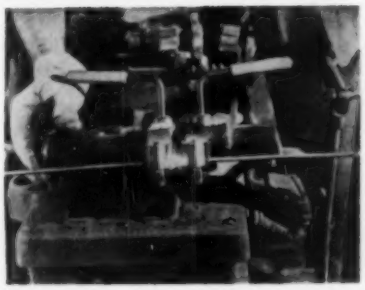
5. Small electrical motors and appliances. Plant employs 4000 workers, has 28 maintenance men for machine tools, 20 for power (electrical). Maintenance head reports to factory manager. Maintenance costs are divided about 50-50 between breakdown repairs and PM. Regular inspections occur every four months, require up to 50-minute shutdowns of each machine. Time and costs of PM are charted, also downtime caused by breakdowns and cost of lost production. Cost has been cut from an average of 2000 yen (about $6) to 1000 yen ($3) per machine in four years. Officials view efficient utilization of maintenance manpower as the biggest problem—how to have enough men to cover breakdowns, yet not sit on their hands other times. Inspection schedules are held intact, but inspection efficacy needs improvement. This will achieve more reliable machine life, allow better programing of machine replacements. Another problem coming up: introduction of automation in production. Present mechanical engineering training will have to be supplemented by electronic knowledge.

Contributions from readers reporting experiences will be welcomed. No need for fancy writing; just a clear, concise statement of facts. If you have photos or drawings, be re to include. We'll edit for the Case Book. Contributions accept:d will be paid for at time of publication. Address: Case Book Editor, FACTORY, 330 West 42nd St., New York 36.

Magnets pinpoint weld joints

A simple magnet placed on the production line can spot the one spring in hundreds that has a weld joint in it at National-Standard Company, Niles, Mich.

This is done by welding a slug of magnetic steel between 10 to 12-ft. lengths of a non-magnetic spring material. The photo at right shows the magnetic slug being welded into non-metallic steel rod.



INGENUITY SLASHES

INDIRECT COSTS

Your customer will never see these costs, but your pocketbook will feel them. They're the costs involved in the manufacture of a product that don't become a part of that product. They include material handling, housekeeping, maintenance, expensed tools and supplies. Though inevitable, they are not fixed. Alert management can hold a rein on them, thus increasing profit margin without loss of operating efficiency or product quality. Here are a few easily adapted ideas used by Sola Electric Company, Chicago, to hold the line on indirect costs.

PIPELINE FOR WIRES Thin-wall electrical conduit (photo above) has eliminated the need for point-of-use storage of wire coils in the lead wire department. Thus, three times more production space is available and material delivery time to the department has been cut more than 50%.

Wire coils are placed vertically in 8-ft. shelves in a storage area. They don't even have to be removed from their cartons. Nine conduits are suspended from the ceiling above the shelves, running to the machines where the wire is used. All operators have to do is feed the wire into the conduit where it's pulled to the point of use. There's no need to use fork trucks for delivery purposes.

SAFETY EYE-CATCHER Vivid aisle markers keep fork trucks and daydreaming workers from knocking tooling fixtures off shelves. Even fixtures over-hanging shelves—fair game for careless persons—can't be ignored with these safety markers.

The markers are made from sheet steel and painted with brilliant green-and-white fluorescent stripes. They're hung by small wires and project far enough out from the shelves to clear all overhanging fixtures.

Cost: less than $1 per marker.

FIGHTING FUMES The vacuum system (below), controlled by workers, keeps solder fumes out of their eyes. Vacuum manifolds run underneath the 40 assembly tables, while flush outlets on the tops have spring-loaded caps. When soldering, workers plug special goose-neck fixtures into the outlets, point them to their work. When exhaust is not needed, the fixtures can easily be removed, leaving a smooth surface for work.

Fingers say when

Steel fingers tell exactly when the desired maximum and minimum diameters are reached with this wood lathe (Rockwell Manufacturing Company, Pittsburgh) at Marshall Studios, Veedersburg, Ind.

The fingers are mounted on a bracket behind the lathe, and can be set for the maximum diameters along the length of the turning. The fingers rest on the stock until the wood is turned to the set diameters. At this point, the fingers fall, indicating the proper diameter has been reached.

No additional calipering is necessary. Tapers between maximum and minimum diameters are handled in the usual manner.

Gas-station answer to epoxy problem

A simple trick—used by your gas-station attendant every time he adds a quart of oil to your buggy—has solved a handling problem at Martin Company, Baltimore, Md. Here, epoxy resins and hardener are emptied from containers into the mixer by means of a sharp end pipe.

Conventionally, resin is poured into the container of a dispensing machine, which automatically adds the correct amount of hardener. This means some waste due to droppage, plus the operator's time.

Martin constructed a tank with one and one-half times the capacity, and a ½-in. larger diameter than a 10-gal. resin container. Midway in the tank a platform is mounted on a pipe that extends about 2 inches above the platform. Upper end of the pipe is cut on an angle that results in a sharp point.

When the container is dropped into the tank, the pipe pierces a hole in it and the resin flows into the tank. A circular seal, cut from a flexible plastic board, is placed in the space between the container and the tank, thus sealing the top from contamination.

A float on the inside actuates a gauge at the top of the tank to show the level of the resin.

City-plant concord helps retrain workers

Cooperation among Litton Systems, Inc., the Los Angeles School system, and the state department of employment is helping to alleviate the unemployment problem in the San Fernando Valley, Calif.

Though many people were out of work in the community, the company was faced with a critical need for electronics assemblers. It had many job applicants but few with experience in this line. Solution: Help the Los Angeles school system set up an evening adult education course in electronics.

Litton helped find instructors for these classes—three are company employees who obtained teaching credentials. The program was later expanded to include day classes. Because no public school facilities were available, Litton hired classroom and lab space and turned it over to the city free of charge.

In setting up the training program, the company also worked with the state department of employment. The latter gave aptitude tests to more than 250 applicants for the course. Of this number, 37 were chosen to participate in the first course and 32 completed it.

During the course, several Litton supervisors visited the class to check on the progress of the students. This privilege was given to all interested companies.

The program is in the process of expanding both in number of classes and content. For example, a new course in electromechanical handling is now in preparation.

Payoff: Of the original 32 graduates of the first course, 19 are now working for Litton.

Real cool answer to hot spots

Dry ice and pipe team up to fight and prevent fires caused by spontaneous combustion in the coal storage area at Dow Chemical Corporation, Midland, Mich.

Several tons of coal had been lost annually through these fires. And the hazard was a serious one.

Now the problem has been licked with a 3-in.-dia. pipe, slit at one end, with wedges cut out to form a point. Several holes are drilled along the pipe length and the top end is threaded to receive a cap. Next the pipe section is filled with dry ice, and driven like a spike into the hot area (photo). This procedure gives two results:

1. It immediately cools down the coal around it.

2. It changes into a gas, forming a blanket of carbon dioxide, which filters through the coal and smothers any remaining fire.

Reprints of the Plant Operations Case Book are available. Price 50¢. For quantity prices, write Reader Service Department, FACTORY, 330 W. 42nd St., New York 36.

YOU BE THE ARBITRATOR

THE CASE OF

The GI's pay day

Out of the experience of the American Arbitration Association

During World War II, a contract negotiated at a metallurgical plant provided four weeks' (160 hours') pay to employees with six months' seniority who entered the armed forces. This clause was continued after the war because young men still faced several years of military service.

In 1955 a new Reserve Forces Act made it possible for boys under 18½ years to enlist for three to six months of active duty. At this point 160 hours seemed too much military service pay. But since the company didn't normally hire anyone young enough to be concerned, it made no effort to get the contract changed.

However, in January 1957, the age limit for short-term enlistments was raised to 26 years. Two employees signed up for six months, demanded the 160 hours' pay.

Management balked. "That provision was not intended to cover enlistments of only a few months," the plant manager said. "We would never have agreed to pay a man one-sixth of what he would have earned. He might be entitled to a small payment under the two-week National Guard Service clause, but that's all."

"The contract doesn't contain any qualifications as to length of enlistment," answered the union representative. "If you think it should, bring it up at the next negotiations. Meanwhile, you have to pay these men."

Eventually, the case went to arbitration. Suppose you were the arbitrator. How would you rule?

For the actual decision turn to page 188

One-piece tank combats cracking

This polyethylene tank handles hydrofluoric acid safely at Fansteel Metallurgical Corporation, Muskogee, Okla. And there's no danger of stress-cracking at the welds and joints. The 350-gal. tank was constructed in one piece.

The tank (American Agile Corporation, Maple Heights, Ohio) can be filled and drained automatically. One pushbutton-controlled pumping device fills the tank while another pump drains off a measured quantity of acid and distributes it to various processing centers.

The plastic tank was fused into one piece through melting—a Spencer Chemical Corporation (Kansas City, Mo.) process.

DELRIN CHAIN

CONVENTIONAL CHAIN

Self-lube chain makes like Eskimo

There's no danger of lubrication freeze-up of drive chains in the 30 F. cold room at Grill Meats, Inc., Sandusky, Ohio. Steel roller chains (top photo) equipped with Delrin (E. I. du Pont de Nemours, Inc., Wilmington, Del.) take the cold in their stride.

Conventional chains used in the past (bottom photo) became elongated and kinky because of lubrication freeze-up. This condition led to costly early replacements. Otherwise, excessive wear from metal-on-metal contact produced metal chips that were eventually picked up by food-handling machinery.

The Delrin (hard plastic) bushings in the new chains have self-lube properties, and require no further lubrication.

Phone the grapevine

Extension 344 is the phone number of the grapevine at Cosden Petroleum Company, Big Spring, Tex.

Employees who dial that number hear one-minute tape-recorded announcements. These are on items of companywide interest such as promotions, conferences, holidays, and other miscellaneous information. Workers are encouraged to dial the number once a day. Downtown employees can also dial it.

The system supplements but does

not replace management letters or bulletins. One of its main purposes is to nip false rumors in the bud.

The device is worked on one station at the Cosden switchboard. Cost is $14 a month for the machine and $2.25 f r the station.

Outdates blueprints

This electrostatic camera-processor has made blueprints obsolete at Chicago Bridge & Iron Company, Salt Lake City, Utah.

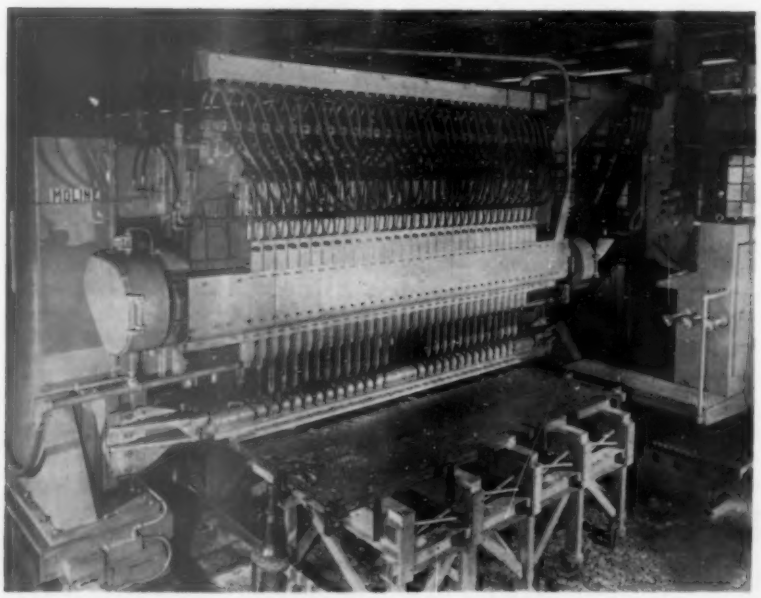
The device produces low-cost paper offset plates in 1 minute. And the complete process of making a plate, installing it on a press, and running copies in quantity takes just five minutes or less.

CBI is using the Electricon (Robertson Photo-mechanix, Inc., Chicago) primarily for copying engineering drawings and diagrams of products such as liquid oxygen tanks. In the past complicated drawings in many sizes and shapes were used. Now all drawings are black on white and standardized. They're easier to read than blueprints and don't fade after exposure to light.

Weight-watchers' woe

You either have to have a small waistline or a small conscience to enjoy your lunch fully at Reynolds Metals Company, Richmond, Va.

Every item on the day's menu is followed by a parenthetical number representing the calories contained in a serving of that item. A large display board listing available sandwiches offers the same service. The cafeteria also serves skim milk for the weight-conscious. Strawberry shortcake, anybody?



TAPE-CONTROLLED MONSTER DRILLS WITH 32 SPINDLES

This multi-spindle machine can drill more than 2000 holes per hour in ¾-in. steel plates at Worthington Corporation, Harrison, N. J. Costing $250,000, the tape-controlled, 100,000-lb. monster is said to be the world's largest drill. It can handle metal plates as large as 165 square feet and can drill in an endless number of patterns. It was manufactured by Moline Tool Company, Moline, Ill.

CASE BOOK CAPSULES

Air pollution detecting device developed by General Electric Co., Schenectady, N. Y., can find a single speck lost among 1000-trillion other specks. It's not yet commercially available.

Corrosion resistance can be improved 20 to 90% in industrial atmospheres when small amounts of magnesium are added to the galvanizing bath. So says Dow Chemical Co., Midland, Mich.

Pocket-size closed-circuit TV camera—9 inches long and under 3 inches in diameter—is now being marketed by Fairbanks, Morse & Co., Yonkers, N. Y.

Removable ceramic transducers for ultrasonic devices have been developed by International Ultrasonics, Inc., Cranford, N. J.

Blue Monday is more than an expression for worker-drivers. A survey by Republic Aviation Corp., Farmingdale, N. Y., shows that most traffic accidents involving employees occur on Monday. Safest day for driving: Wednesday.

Ion emission microscope, powerful enough to magnify the head of a pin to cover a 250-square-mile area, will be exhibited at the 1962 Seattle World's Fair. It will magnify two million times. U. S. Steel Corp.'s lab at Monroeville, Pa., is now using the device.

American business spends $25- to $30-billion for on-the-job training, according to a University of Michigan director, speaking at the American Society of Training Directors, Philadelphia.

Standards work on numerical control of machine tools and process control computers is expected to start later this year by American Standards Assn., New York.

Design concepts for bumpers to protect tomorrow's space ships in collision with meteoroids are being worked out by General Dynamics Corp., New York.

Does work of eight

Double-disk grinder pays off big

A double-disk grinding machine does the work of eight milling machines 10 times faster at Ford Instrument Company, Long Island City, N.Y. The horizontal spindle precision machine is used to produce close-tolerance aluminum plates.

The plates have to be ground to a tolerance of 0.003 inch, and the job is really tough when the plates are as large as 14x18 inches.

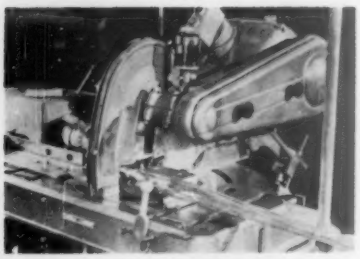
The job used to be done with a fly-cutting tool on a milling machine. But this was out of the question for large production runs. A skilled operator took about two hours to turn out a single plate.

Now a plate can be produced in less than a minute with the double-disk grinder. The set-up is simple. The work is just placed in the blade of a roller gun-type fixture, which takes only a few seconds.

Because the part is actually floating between two grinding disks rather than clamped down on a machine table, it can be ground on two sides simultaneously. Besides saving time, this has greatly increased the accuracy of finished parts and has almost eliminated rejects.

Ford also uses the grinder to grind brass cam masters. It formerly took a skilled technician two days to scrape the cam manually, face it, and then check it. Now the grinder turns one out in three hours. Production of 2000 cams alone has paid for the cost of the grinder several times over.

The grinder is made by Gardner Machine Company, Beloit, Wis.



Pushbutton saw cuts costs in half

This standard cutoff saw (Delta Power Tool Division of Rockwell Manufacturing Company, Pittsburgh) has reduced cutting costs by 50% at Baso Inc., Milwaukee.

The tube cutting installation is equipped with a pneumatic power pack which automatically indexes copper tubing into position for cutoff to the required size.

The power package, developed by Bellows-Valvair, Akron, Ohio (a division of International Basic Economy Corporation), includes a power unit and two air motors. One motor clamps the stock into place and the other feeds the saw.

The automatic sequence starts when the operator clamps the tubing bundle into place. The blade cuts, then retracts, and the clamp opens automatically.

At any point in the cycle the operator can halt the operation simply by depressing the stop switch. This immediately retracts the blade and releases the clamp.

In addition to slashing labor costs, the saw has reduced worker fatigue. This, in turn, has improved product quality with a consequent 20% drop in rejects.

There's a big angle to unloading here

This truck goes way up to deliver its load of grain at the Port of Seattle, Wash. The truck dump (Airoflex Company, Minneapolis) consists of a special ramp on which the truck is anchored and tilted at a sharp angle. Then gravity takes over, causing the grain to slide into a storage bin.

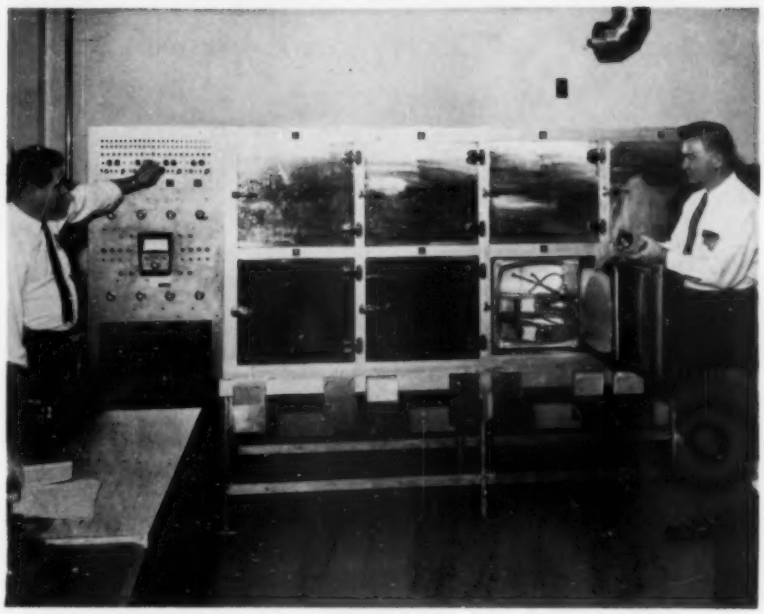
The dump cost about $60,000, can handle 10 to 12 grain trucks an hour. Manual unloading used formerly was time-consuming and cost two-thirds more.

Phone signal lights slash waiting time

Ever waste precious minutes trying to get a tie-line call to your subsidiary plant a couple of states away? That problem has been partly solved at Wilmot Breeden Ltd., London, England, by signal lights.

Small red warning lights are turned on by the switchboard operator in each executive's office and in other parts of the plant when calls to its Birmingham Works are being made or received. This means that anyone wishing to contact any of these places can do so while the line is still available.

This system is used by several plants in Britain. In some cases different colored lights identify different plants.



Keeps barrels in tow

These gravity-feed barrel racks with arrester gate are currently being tested at B. P. Ltd., London, England. They can simplify barrel handling as well as cut down your space requirements.

Barrels are loaded from the rear and roll toward the removal end. There they are held in position by the arrester gate. This gate also acts as a shock absorber, thus eliminating the need for a heavy frame. Barrels can be removed one at a time while the gate holds the remainder in position. When one barrel is completely withdrawn, the succeeding drum automatically rolls forward to fill its place.

The rack, custom-made for each application, has been developed by Dexion, Inc., Woodside, N. Y.

Automatic oven doubles output

Automatic cycle control on a bank of drying ovens has more than doubled production with only one-seventh the manpower at Lear, Inc., Grand Rapids, Mich.

The company manufactures various flight reference indicators. Since specifications require the moisture content of these instruments to be at — 80 F. dewpoint, they are heated and gas-scrubbed in ovens.

The old method required the continuous presence of an operator to regulate manually the 22 steps required for the 12-hour cycle.

It now takes less than two man-hours per cycle. After loading the eight chambers, the operator just switches on the automatic control and leaves. The automatic cycle includes a preliminary one-hour bake, followed by flushing with dry nitrogen and deep vacuum bake. The unit even monitors its own performance and sources of supply to avoid waste and damage.

The new system is so reliable that spot-checking has replaced 100% inspection of the instruments. Production has increased from 400 to 900 units per month. Lear designed and built the system.

Hushed test benches are easy on ears

Twelve sound-absorbing test benches deaden the noise of big electric drills and saws at Portable Electric Tools Company, Geneva, Ill. Each tool is tested after assembly, and the benches save wear and tear on employee nerves.

The benches come in three sizes depending on function. Cost: $175, $250, and $650. The hoods are built of sheet metal covered with ceiling-type acoustical tile.

Electrical sockets beneath the bench provide a convenient place to plug in the tools. Two meters above the bench give power consumption information. The operator can throw a switch which shunts 1200 volts through the motors for a check on the insulation.

Large benches have motorized conveyors that carry products from assembly through testing to packing.

ENDLESS LAZY SUSAN DUBS AS CONVEYOR

These giant lazy Susan turntables speed production at Minneapolis-Honeywell Corporation's downtown Minneapolis plant. When an operator finishes a job, she places it on the turntable. Then the next operator takes an item from Susan, performs her task, and places it on the next Susan at her other side. The individual table levels rotate separately for greater flexibility.

YOU BE THE ARBITRATOR

Continued from page 184

The award: The arbitrator said: "I am not disposed to correct the parties' collective bargaining agreement by making allowances for unanticipated changes. There is no provision for reopening of this section, and modification of the contract by the arbitrator is expressly forbidden. The arbitrator is therefore powerless to find other than that the 160 hours of pay shall not be withheld."

Caution: The award in this case is not an indication of how other arbitrators might rule in other apparently similar cases. Arbitrators do not follow precedents. Each case is decided on the basis of the particular history, contract, testimony and other facts involved.

Wire storage pallets help fumblers

This overhead wire dispenser is making the assembly of electronic harnesses virtually fumbleproof at Temco Electronics and Missiles Company, Dallas, Tex.

Enough wires for most harness assemblies can be stored in a single 2-ft.-sq. plywood pallet. Pallets can be easily transported from storage to point of use. The wires are placed in 48 pairs of 1-in.-dia. holes distributed in four rows.

Using pairs of holes has two benefits. First, there's enough tension created in each wire to keep it in place when an individual wire is withdrawn. Second, pairs of holes cause each wire end to be suspended so the bare conductors are less likely to fray. Here's the way the holes are filled:

Ends of a wire are inserted into a pair of holes, leaving a loop exposed on one side of the pallet. Each pair of holes is marked with a wire code. Wires may be stored by code number or operation sequence.

Doors are passé in new furnace

Air curtains take the play away from doors in the recently installed 310-ft. gas-fired furnace at A. O. Smith Corporation's Kankakee, Ill., plant. It's said to be the world's largest radiant furnace.

Carried continuously along an overhead conveyor, the water heaters pass right through an air curtain to a preheat area and a heating zone before they exit from the furnace through a second air curtain. This means the system doesn't have to be stopped or slowed down while doors are opened and shut.

The system also has a safety check in the form of electric eyes spotted throughout the oven. These automatically sound an alarm and halt the furnace if the conveyor shifts out of line.

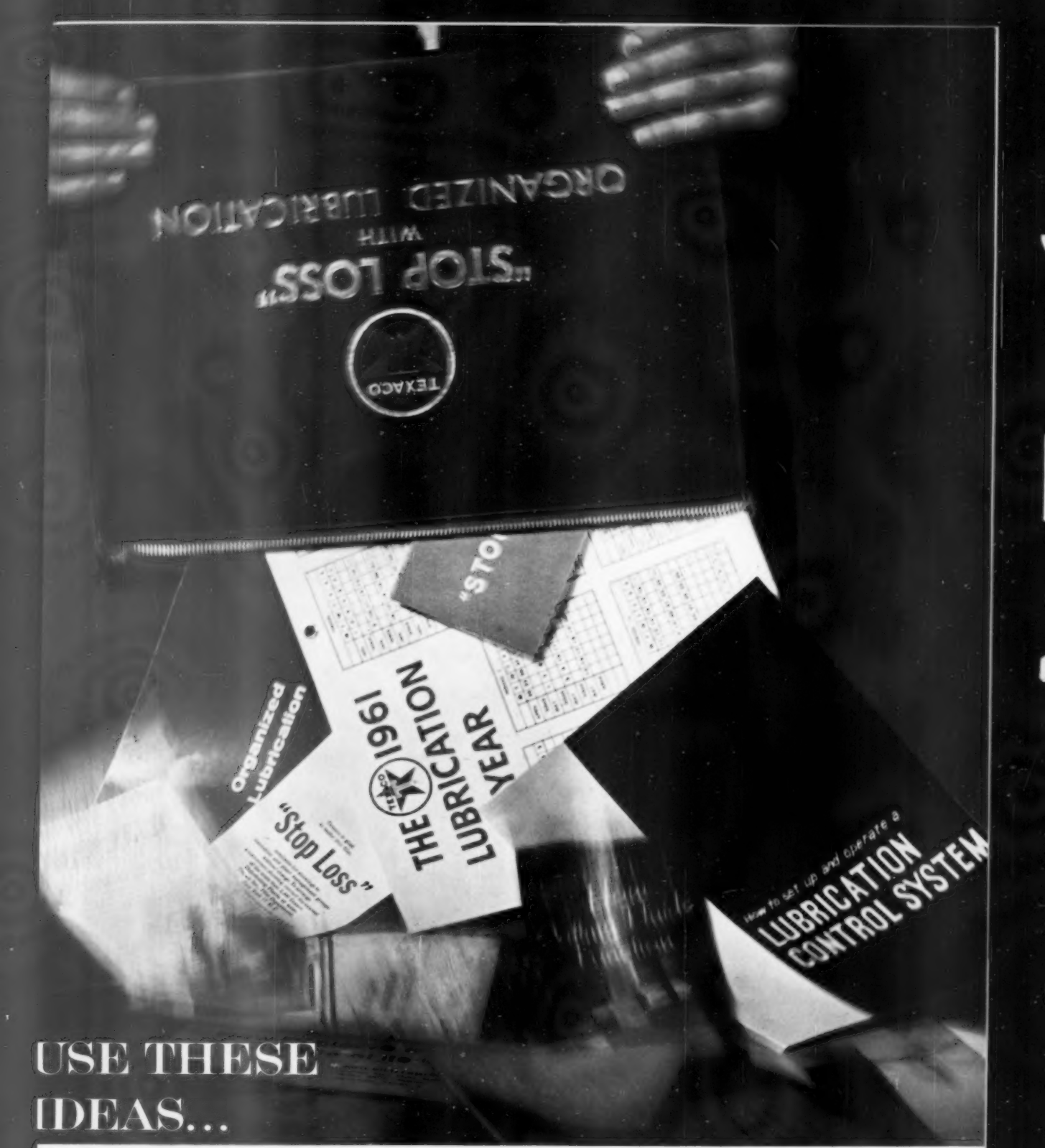
The continuous furnace (Ferro Corporation, Cleveland) has stepped up the plant's production capacity from 52,000 to 66,000 water heaters per month.

Big picture in 3-D

These 3-D glasses are putting an end to eyestrain at North American Aviation, Inc., Los Angeles. They're used for precision work involving miniature gauges.

The glasses magnify the specimen from 2¼ to 3½ times, at the same time giving the wearer a three-dimensional view. And they leave both hands free for the operation.

Manufactured by Edroy Products Company, N. Y., the glasses sell for $12.50 to $15.



USE THESE IDEAS...

TO GET UP TO AN EXTRA 4% NET PROFIT

Out of the Texaco man's briefcase comes a wealth of ideas for cost control through organized lubrication—Texaco's "Stop Loss" Program. Managers in many industries are already using these plans to reduce losses in three important areas: production, maintenance and purchasing. Their savings go directly into profits—the average is a 4% gain in their net. Get the facts. Write for our informative folder: "How to Starve a Scrap Pile." **TEXACO** INC., 135 East 42nd Street, New York 17, N. Y. Dept. F-190

TEXACO

Here's Take-Your-Choice Versatility

with the Multi-option Fenwal 536 Temperature Controller

It's so *precise* and yet so *easily adaptable* to an almost endless variety of temperature control applications, you become all but convinced that the transistorized Model 536 was engineered with only your needs in mind!

From its multi-option printed circuit board to its numerous interchangeable components, the Model 536 Temperature Controller spells *versatility*. ON/OFF or proportioning control . . . dial for set point adjustment mounted externally or internally . . . expanded scales for precise temperature adjustment — the 536 offers all these advantages! Five standard temperature ranges from −50 to +600°F . . . separate potentiometer with graduated dial and knob for remote temperature adjustment . . . capacity of 10 amp/110 VAC and 5 amp/230 VAC . . . these choices are also available to you. *And you pay only for the options you need!*

The 536 is sensitive to within 0.1F°. And if you wish to build a multi-point control and indication system — either gradually or all at one given time — you simply combine the Fenwal Model 580 Temperature Indicator with as many 536 Controllers as you require. Thermistor sensors enable fast response and ordinary copper lead wire may be used for connections. Removable interior of the Model 536 allows easy, safe installation and the instruments are smartly styled to perfectly complement modern industrial machines and interiors.

Find out more about how the precise Model 536 Temperature Controller can be adapted to your exact needs by writing to FENWAL INCORPORATED, 259 Pleasant St., Ashland, Mass. Request Bulletin MC-195.

Another example of how

Fenwal CONTROLS TEMPERATURE . . . PRECISELY

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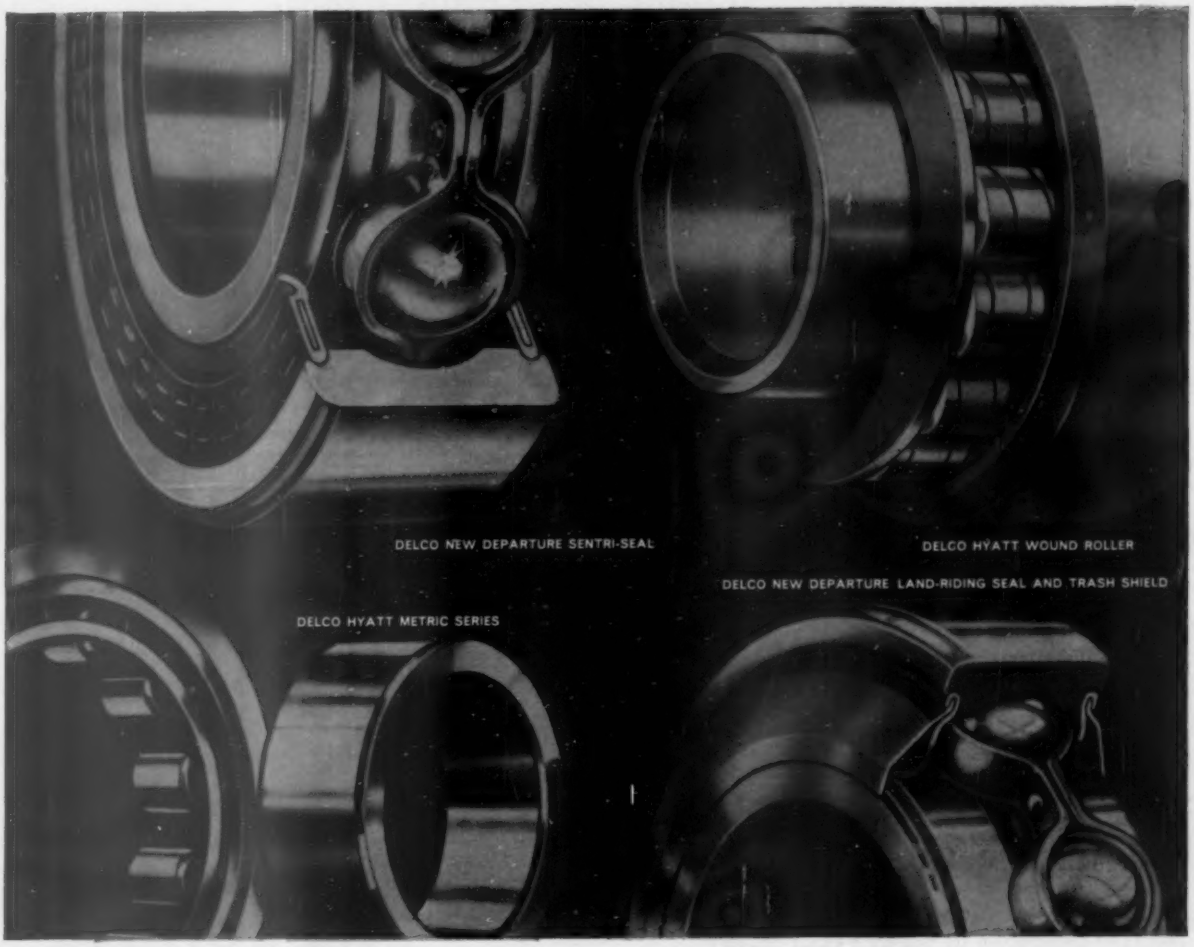
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HUMAN RELATIONS

By Vivian Lunardi, Assistant Editor, FACTORY

Members put union on hot spot

When a union is charged with irresponsible action toward its members, it's liable for damages. So ruled a district court against the International Union of Operating Engineers.

This decision is bound to provoke second thoughts on a union's responsibility to its members and their employers in a strike.

The jury ordered the union to pay nearly $1.2-million in damages to 28 of its members. Settlement covered pay lost when these men were fired by Phillips Petroleum Company for obeying union orders to close down its Borger (Tex.) refinery.

Members sued the International and Local 351 in Phillips, Tex., as the result of a May 1958 strike. Prior to the strike, company officials served notice to the union that supervisory personnel would continue to operate its refinery during the strike. The company fired the 28 employees when they tried to close down the refinery. Union officials involved denied issuing the closedown order.

The district judge ruled out all claims for damages in the original suit for $4-million—with the exception of loss of pay.

Polish from paint and plaster

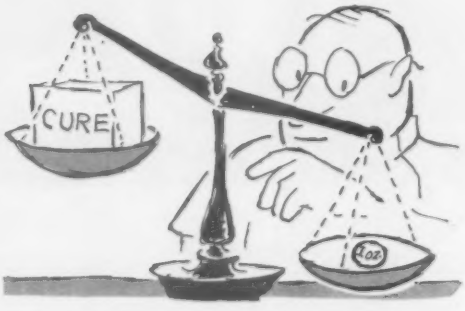
The "arty set" now includes at least 40 U. S. corporations. No derogatory label, it just shows how many American firms are including art in decorative schemes for reception rooms and offices.

An exhibit of 70 of these corporate-owned paintings and sculptures will be held at the San Francisco Museum of Art from Sept. 14 to Oct. 15. Most have been produced in the 20th century by such internationally known painters as Burchfield, Gris, Hofmann, Kandinsky, Klee, Leger, Marin, Miro, Picasso and Tamayo. Sculptors include Bertoia, Calder, Lipschitz, Rivera, and Rosenthal.

Just growed, like Topsy

Fringe benefits are getting an upward nudge in contract settlements this year. So chances are you'll soon be handing out more than the 45¢ an hour per production employee paid out by the average U. S. manufacturer in 1959. Amounting to over 20% of payrolls in 1959, more than half these benefits went directly into workers' pay checks. The rest went to jobless, retirement, and disability funds, reports the Commerce Clearing House, Inc., Chicago.

An industry breakdown shows the primary metal manufacturer paying 66.2¢ per hour per worker in fringe benefits. This was second highest, the petroleum and related industries coming off with top honors at 88.3¢ per hour.



An ounce of prevention...

If you're a small firm, can you afford *not* to have a health program? No, says the Small Business Administration, Washington, D. C. You may have to pay higher amounts per employee than large companies for such a program, but the cost is still low.

Small plants have an employee disabling injury rate two and a half times higher than large firms, and absenteeism due to illness is also higher. A good occupational health program can raise employee morale and efficiency by improving health. It can also reduce turnover by improved employee selection, decrease absenteeism with preventive health plans.

But what about costs? There is a way to lower them by forming a cooperative group of local small plants. Each plant in the group can get the part-time services of a doctor and nurse acquainted with in-plant conditions and problems. Or it may be possible for a group to hire a professional team to rotate from one plant to another on a part-time basis. (Write to SBA for No. 126, *Health Checklist for Small Plants.*)

Turn the page

YOU CAN'T GO WRONG SPECIFYING WING GAS FIRED HEATING AND VENTILATING EQUIPMENT

It's fact. New plant or old plant heating and ventilating modernization needs are best handled with Wing gas fired equipment. Proved: high efficiency performance, fuel economy, ease of installation, service dependability, and long life with low maintenance make Wing heating and ventilating equipment first choice of most quality conscious engineers. Be right — always specify Wing.

Gas Fired
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Six downblow models. Coverage up to 145' sq. Capacities from 320,000 to 1,200,000 Btu/hr. Mounting heights to 65 feet.. 4 fixed and 4 revolving discharge outlets available. AGA approved components.

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Five sizes. Capacities from 1,500,000 to 4,500,000 Btu/hr. and 15,000 to 50,000 CFM. Horizontal or vertical air discharge with wall or roof inlet. 6 fixed and 3 revolving discharge outlets available.

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These Crescent socket wrenches, for example, are made from a special high grade alloy steel. This makes possible thinner side walls, for getting a firm, safe hold in tight places, with no sacrifice in strength. They are precision-machined . . . no slip or slack . . . no work-foiling burrs. They're handsomely chrome-plated, too . . . important to the conscientious mechanic who takes pride in his work and takes care of his tools.

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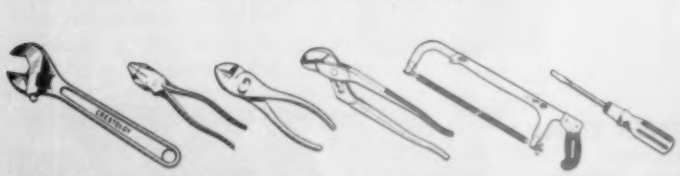

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Begins on page 192

HUMAN RELATIONS

Roses among the ivy

The walls of ivy are parting for management women who will admit their age. Those between 36 and 50 years old, sponsored by their companies, are to be admitted to the 41st session of the advanced management program at Harvard University's graduate business school, Cambridge, Mass.

Doors to this 13-week course have been open to men only for the past 18 years. Now women with 10 to 15 years' business experience, and who hold executive positions, will tread the hallowed halls next February.

Sharing the judgment seat

"Playing God" is no way for a supervisor to evaluate the performance of a subordinate. This method, based on strengths and weaknesses followed by corrective action, creates antagonism and resentment.

A better way is to share appraisal responsibility equally between worker and supervisor, says Dr. O. H. Tribble, associate professor of psychology and a member of the management training staff at Pennsylvania State University, University Park. This requires the supervisor to consult with a worker on the job and arrive at a joint evaluation. This approach increases a manager's understanding of problems in each job, and develops his skill in handling men. Here are seven steps in this collaboration:

1. **Analyze the job** by identifying three factors—responsibilities, duties, and degree of authority.
2. **Agree on conditions** that would exist if the job were performed correctly.
3. **Examine present performance.**
4. **Pinpoint factors** that are likely to influence below-par performance.
5. **Outline steps** for improving performance level.
6. **Plan specific steps** such as further training of the worker, change in practices of the supervisor, organization changes, etc.
7. **Follow up outcome** of steps in No. 6 to decide if revisions are needed.

Workers participating in such an evaluation tend to develop feelings of self-respect and dignity, concludes Dr. Tribble.

Turn the page

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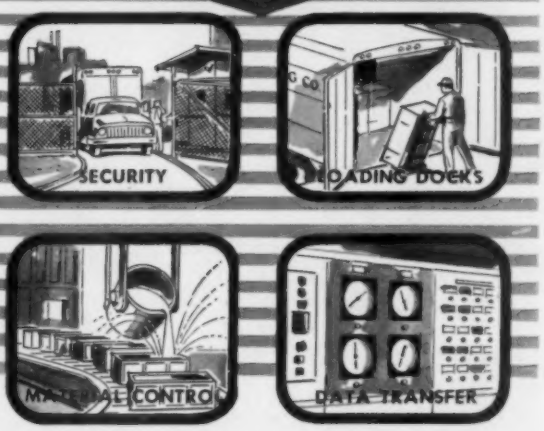
CLOSED CIRCUIT TV

ELIMINATES INDUSTRIAL "BLIND SPOTS"



Philco closed circuit TV has proven invaluable in checking operations that are normally difficult and awkward to monitor in person . . . material flow on conveyors . . . bin levels . . . loading dock traffic . . . gate traffic . . . gauge watching. In addition, closed circuit TV can be used in employee instruction and plant communications. Philco's broad experience in CCTV guarantees putting this very flexible business tool in use to your best advantage. Fully transistorized equipment featuring Philco's "building-block" design assures ease of operation, freedom from maintenance problems and permits future expansion without costly replacement. Write today for your copy of the Philco Closed Circuit TV System Planning Guide.

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Begins on page 192

Management's grave obligation

To what extent is management duty-bound when an employee dies? The answer runs the gamut from settling insurance claims to employing the widow.

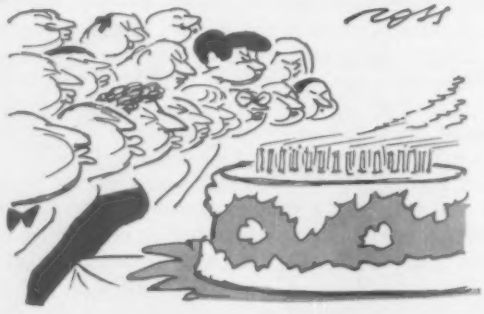
A survey of 42 companies by the National Industrial Conference Board, Inc. (New York) suggests four broad categories of company action:

Money payments include unpaid earnings, remittances from insurance and pension plans, fractional pay adjustments, continuation of pay to end of regular pay period or for stated time beyond date of death, and emergency loans or gifts.

Expressions of sympathy may take the form of flowers, letters of condolence, company representation at funerals, flags at half-mast, or memorials.

A company can extend help with funeral arrangements by notifying immediate relatives, suggesting a reliable undertaker, shipping the body, claiming the body at the morgue, providing pallbearers, transporting out-of-town relatives to and from the funeral, and furnishing cars with drivers.

Other assistance to survivors that a company may choose to offer includes help in claiming Social Security and veterans' benefits, clearing up tax and legal difficulties, shopping, providing repayments to the blood bank, continuing hospitalization coverage of dependents for a stated period, and employing the widow or other dependents.



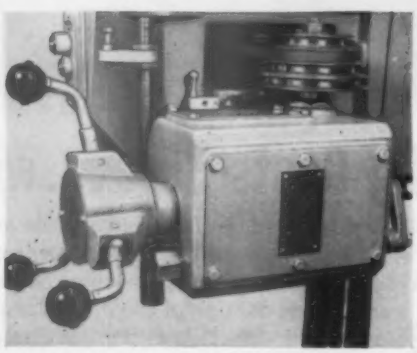
Big blow-out snuffs 80 candles

Come one, come all to Brubaker Tool Corporation's 80th birthday party. The invitation went to citizens of Millersburg (Pa.) and surrounding communities to celebrate at the local park.

It was quite a wing ding. There was a parade, a band, company speeches, and cash awards for four high school students who wrote the best essay on "Small Business—The Backbone of Rural America."

But what's a birthday without a cake. And this one was a whopper—400 eggs, 75 pounds of flour, and as many pounds of sugar. Apparently, slicing it to serve over 1000 guests was no problem to this manufacturer of cutting tools. Happily, all guests shared in wishing Brubaker good fortune.

You can do more with these ALL NEW DELTA 17″ drill presses



Equipped with exclusive new Rockwell Power Feed, these presses can operate in remote control or be interlocked with automation devices. Available as original equipment or as an accessory on every model.

FREE BROCHURE—Complete specifications on the new Delta 17" drill presses and accessories. Write: Rockwell Manufacturing Co., Delta Power Tool Division, 628J N. Lexington Ave., Pittsburgh 8, Pa.

Here's a major engineering advance from Delta to give you increased drilling accuracy, more job flexibility and greater operating economy. You can choose from 76 models that incorporate these up-to-date performance features: New Internal Depth Stop Mechanism, Quick-set Depth Gage, Interference-free Guard and Pivot-type Motor Mount.

These drill presses are completely new—not merely improved or restyled—but actually redesigned to deliver consistent precision operation under the most rugged work loads with little or no maintenance.

Your Delta Industrial Distributor (listed under "TOOLS" or "MACHINERY" in the Yellow Pages) will gladly demonstrate how these 17's can save you dollars, hours and material. Why not call or see him soon!

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Diebold Cuts Heating Costs 35%...with

"We know it sounds impossible, but our Perfection Schwank *Gas* Infra-Red Heating System has reduced heating costs 35%," says William Roby, Assistant Plant Engineer at Diebold, Inc., Canton, Ohio. "Heating comfort alone would have justified our investment, but here's the clincher. In another 2½ years, our tangible savings in heating costs will have completely paid for the entire *gas* infra-red system! Gas keeps the *fuel* cost low. And there are practically no maintenance costs."

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Heat better for less with Perfection Schwank *Gas* Infra-Red Heaters. For complete information, contact your local Gas Company or write to Perfection Division of Hupp Corporation, licensee of American Infra-Red Radiant Co., 1135 Ivanhoe Rd., Cleveland 10, Ohio.

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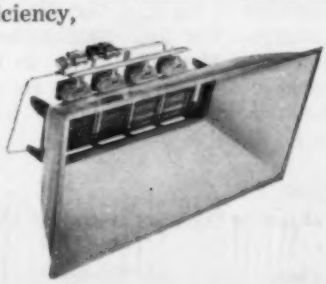


Approved by A.G.A., Underwriters, C.G.A. and C.S.A. Under Schwank U.S. Patents 2,775,294 and 2,870,830 and pending applications.

FOR INDUSTRIAL HEATING ...GAS IS GOOD BUSINESS!

By Paul Ruig, Member, New York Bar

When job applicants lie or withhold information

You can fire a worker who lied about his background when he filled out his application form. But how about the man who deliberately conceals something?

NEWS TIPS

- Under a contract provision calling for a 3-day trial on a new job, the employer may extend the period for another day. The 3-day period is a *minimum* only.

- Add a half-step to the grievance procedure, recommends Western Electric Labor Counsel R. A. Levitt. His suggestion: Just prior to an arbitration hearing, let opposing counsel have a frank and open discussion of the grievance; try to settle things themselves.

- When the arbitration hearing is over and done with, it's bad practice to send the arbitrator letters furnishing him with additional facts and arguments—unless the union clearly goes along with the idea. It may be enough to upset the arbitration, although Arbitrator Milton H. Schmidt decided otherwise in a recent case. The arbitrator's opinion showed that letters sent by the parties did not enter into his decision.

- Lie detector tests may be effective—but can you use them? In-plant stealing is big business, and it's hard to catch the culprits red-handed. Can you force employees to take a lie detector test? As a rule, arbitrators will answer "no." Suppose your employees agree to take the test, and you detect a thief? Can you fire him? Probably not—unless there is *also* some connection between worker and theft. Here's a good one: stolen goods actually found in his car.

It's nothing new when job applicants lie about their past education and work experience, their police records, or their former places of employment. Recently, in Shiremanstown, Pa., an applicant for a Quaker Oats Company job lied about having suffered a coronary attack. Well, he didn't exactly lie—he just didn't happen to mention it when he was hired.

These questions come to mind in such situations: Can the applicant be fired when the truth comes out? Is there any time limit? Does the nature of the falsehood have any bearing? For that matter, is an employee's failure to volunteer an important fact tantamount to falsehood in the first place? Can application blanks be improved to protect the company in such cases?

Arbitrators will uphold the discharge of an employee if the falsehood is material. But their key concern is the time interval between the application, the discovery, and the termination. In the Quaker Oats case, union researchers came up with a one-year (from date of hiring) "statute of limitations," which they claimed arbitrators had frequently enforced.

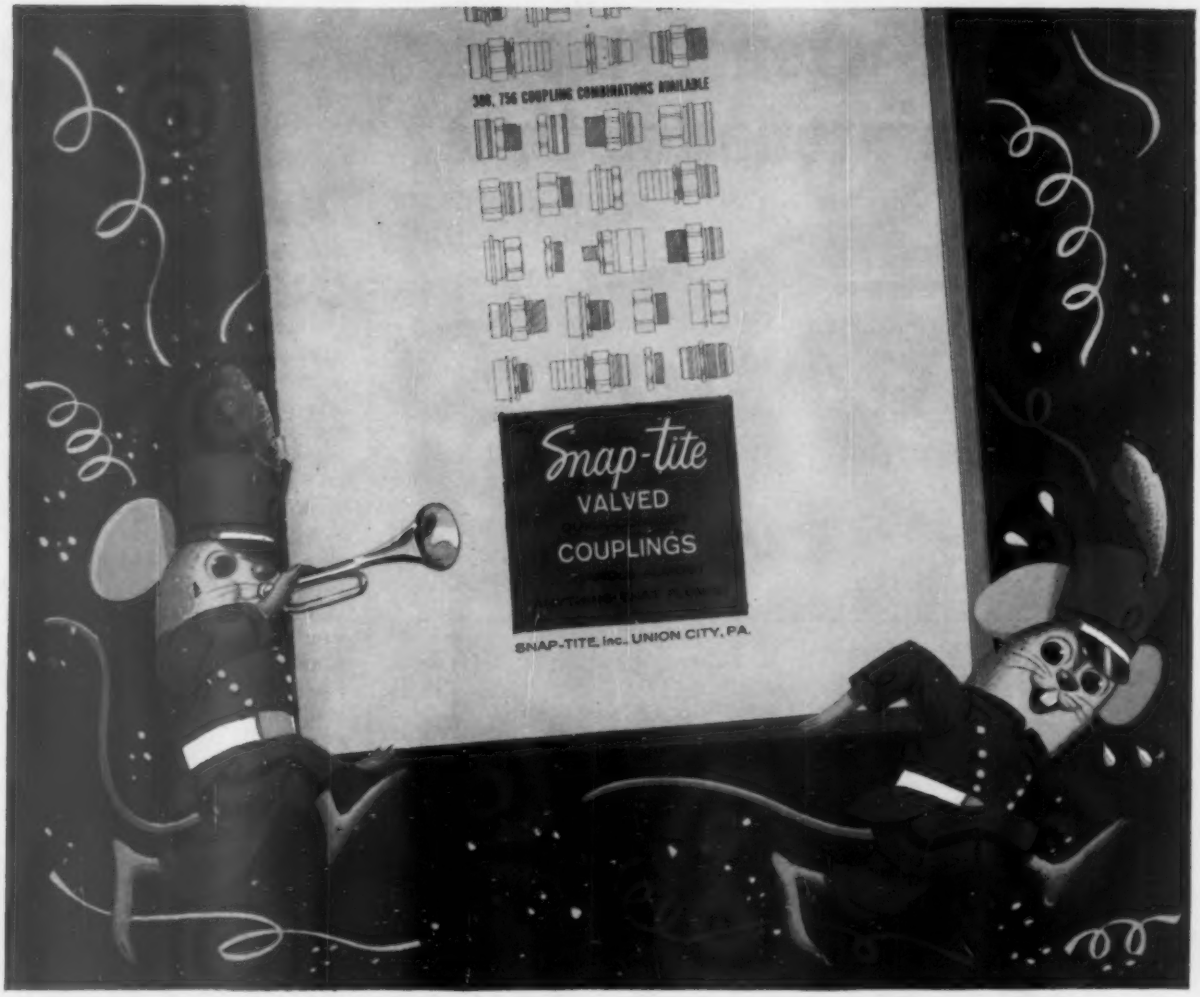
This must be taken with a grain of salt, pointed out Quaker Oats Arbitrator Samuel H. Jaffee. All falsities cannot be lumped together, nor have all arbitrators favored a flat one-year rule. He distinguished between a coronary case and other types of falsehoods. ". . . Falsities as to such things as work history, past education, and police records were falsities as to things which were over and done with, incidents that had ended and were finished. This can hardly be said of [the grievant's] coronary. Was not his 'heart condition' a continuing situation?"

In the case heard by Jaffee, the employee failed to reveal on the employment application form that he had previously suffered a heart attack. When questioned by the company nurse during his pre-employment physical, he again failed to disclose it (although the nurse hadn't asked him the question point-blank). And the company medical examination didn't turn up the condition. Fourteen months later, when his production lagged, the employee acknowledged his heart condition and was fired.

The discharge was upheld. Arbitrator Jaffee concluded that the employee was aware that his heart condition was material to employment. "His failure to reveal it was as much concealment as a false response to a specific inquiry."

To remove all doubt, the employment application should caution the applicant in big print that the penalty for filing false information is discharge. The form should contain specific questions covering all aspects of his background. In those companies where pre-employment medical examinations are not the rule, the applicant might be required to complete another form answering specific questions about his health.

Turn the page



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New all-wrench tool set cuts maintenance time

Snap-on

181-piece nut-turning set

SNAP-ON 5181-GS-B Set
181 tools in metal box

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Socket wrenches include handles and sockets in 1/4-in., 3/8-in., 1/2-in. and 3/4-in. square drive sizes. You get a full range of socket handles — ratchets, speeders, slide bars, spinners, extension bars.

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For more facts Circle 514 on Reader Service Card

Begins on page 200

LABOR RELATIONS

Community support loses election

You do not always end up on top when the "people" are with you—not when the NLRB gets sore.

Taking your case to the people is standard operating procedure in this country of ours. Politicians do it, unions do it—but the NLRB bellows if management does it. In fact, it gets upset even where "the people" take management's side on their own hook.

NLRB Member John Fanning reminded a group of southern newspaper executives of this situation. He mentioned the Monarch Ribbon Company case, and the more recent James Lees and Sons case. About Monarch: The petitioning union filed objections to an election on grounds that, the day before . . . an advertisement appeared in the local newspaper threatening employees with loss of jobs if they voted for the petitioner. Upon investigation, it was learned that the publisher of the paper first approached the company. He pointed out that a similar advertisement had appeared several years before, in connection with another firm; said he was going to try to interest the local chamber of commerce in sponsoring the advertisement. The company official said neither yea or nay.

Thereafter, when the chamber of commerce showed no interest, the publisher ran the ad himself, free of charge—ostensibly sponsored by "local businessmen." The Board found that the threat of job loss contained in the advertisement was sufficient grounds for setting aside the election, even though the employer was not responsible for it.

Fanning then turned to the Lees case. "In a somewhat similar case, there was considerable fear in a particular community that, if the union won the forthcoming election, the employer involved would leave town. Editorials to this effect appeared in the local newspapers, and advertisements of similar tenor were sponsored by local citizens. A majority of the Board found that such conduct created a general atmosphere of fear and confusion, pre-

British Admiralty chart of New York harbor (1775) reproduced on Kodagraph Contact Film, Estar Base. Courtesy of New-York Historical Society.

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1. Kodagraph Autopositive Film, Estar Base. First choice for general reproduction work. Gives you same-size *positive* second originals *directly.* Excellent results obtained with print-through or reflex printing (even from metal templates). Can be exposed and processed in room light.

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3. Kodagraph Projection Film, Estar Base. Welcome change-of-scale "specialist." This high-contrast, quick-processing film gives you sharp and clean results when enlarging microfilm negatives, or reducing large drawings, blueprints, maps. Can be handled with 1A (red) or OA (yellow) safelight.

For further details, write to Eastman Kodak Company, Graphic Reproduction Division, Rochester 4, N.Y.

NEW! **Kodagraph**

REPRODUCTION FILMS

for best line-for-line reproduction

For more facts Circle 515 on Reader Service Card

RAPISTAN Ideas HANDLING

HOW "TECHNICS" PLANNING PAYS "COMPOUND SAVINGS"

In any business, whether yours is a manufacturing plant, a wholesale warehouse, a retail or chain operation, or a service industry, materials handling is the one function that is closely related to all the other management arts.

Because of its influence on so many other departments and functions, it can be utilized as a management tool, to coordinate methods improvements throughout an organization, directed toward the common goal of reduced operating costs and increased profits.

This principle is the basis of Rapistan's proven "Technics" approach to cost reduction. It starts with the materials handling system, in all its aspects; then, extends the benefits of improved materials flow to produce subsidiary benefits in other areas of management as well.

New containerization of these conveyor wheels, specified by Purchasing, coupled with a new automatic unloading device designed by Plant Engineering, speeded truck unloading to 1/12th the former time. Wire-bound crates are designed for re-use as finished goods shipping containers for a further saving.

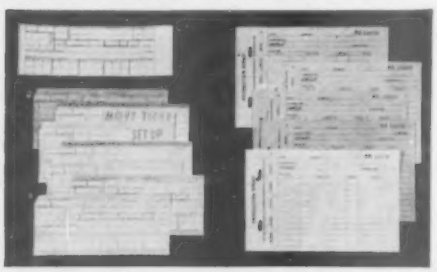
Thorough Planning—The Key

Rapistan's "Technics" concept of materials handling goes an important step beyond solving the problems of movement, transfer, storage and flow control. It recognizes the inter-relationships of the flow system with other management functions—purchasing, industrial engineering, product design, manufacturing, quality control—even clerical procedures.

By thorough planning, to augment and capitalize on improvements in the flow system through all related management activities, a "Technics" plan gives management maximum return on its investment.

A successful Technics program requires skillful coordination, under centralized and authoritative direction. Only top management can provide this. But, by the nature of his specialization, the materials handling engineer can contribute much to such a program. Your Rapistan sales engineer can offer new ideas and techniques of materials handling. And, his knowledge of "Technics" principles can help you compound the savings in many related phases of your total operation.

Plant engineers who designed this transfer mechanism to match Rapistan live storage Flow Racks helped make the entire system more efficient and versatile. Such contributions illustrate relationship between plant functions and materials handling, developed through Technics planning.



IBM data processing is coordinated with the flow system in this successful Technics program. These cards trigger movement of raw materials and work in process into and out of storage, and over the conveyor system between manufacturing operations.

This new brochure illustrates "Technics" planning at work in the management of materials, solving problems of inventory control, order selection and similar warehousing functions for manufacturing and distributing firms. For your copy write to The RAPIDS-STANDARD CO., Inc., 547 Rapistan Bldg., Grand Rapids 2, Michigan.

Rapistan®
CONVEYING EQUIPMENT

cluding the holding of a free election. The election was set aside."

What's the answer? To avoid this kind of thing, management should not actively engender community support. Certainly not if it looks as though management would win the election without it. And if success seems *probable* without community support, perhaps management should actively renounce it. On the other hand, if the cards are stacked against the company anyhow, there isn't much to lose by enlisting community aid.

About rehiring the offbeat worker

Where does sympathy end and prudent business practice begin? Should psychoneurotic employees be rehired after their "cure"? Should reformed convicts be hired?

A judgment of $96,000 was recently handed down against the New Haven Railroad in favor of the widow of a railroad fireman who was fatally shot by a fellow worker. Basis of the action: The railroad was negligent in rehiring the man who did the killing. It knew he had a history of mental disturbance.

Several years before this case, an employee of a manufacturing company was injured by gaseous fumes in the plant. He sued for $50,000 on the ground that his supervisors were negligent. Either they failed to train the men responsible for the overdose of gas, or they were negligent in hiring ex-convicts who were "prone" to fool around and play "practical jokes." The lawsuit was settled out of court.

This type of case lays it on the line at least in those states where Workmen's Compensation is not the only remedy available; that is, where employees can sue on the grounds of negligence. Should you rehire a neurotic employee who says he is cured? If you do, you may be damned by a judge, as the railroad was. If you don't, you may be damned by an arbitrator who, at the union's insistence, may *order* you to rehire the employee.

What do you do? First, find out how your state views this type of lawsuit, and whether there is insurance coverage on this type of risk. Workmen's Compensation coverage, *per se*, may not protect you. Second, when you rehire a "cured" psychoneurotic, be sure you have in your files a clear statement from a competent doctor that there is little likelihood that the employee will become dangerous. (A contrary statement from the doctor may help if you should be hauled before an arbitrator for not taking him back.) But, if you do take him back, watch him carefully. If symptoms of his problems recur, take it up with the employee, the union, and the doctor.

As to rehiring ex-convicts, a lot depends upon their offenses. If they were convicted of rape, mayhem or assault, you are undertaking a big risk if they work closely with others. There may be little risk if their offenses were less heinous. Take up these problems with your Workmen's Compensation carrier. It has a lot of experience in these areas and can be very helpful.

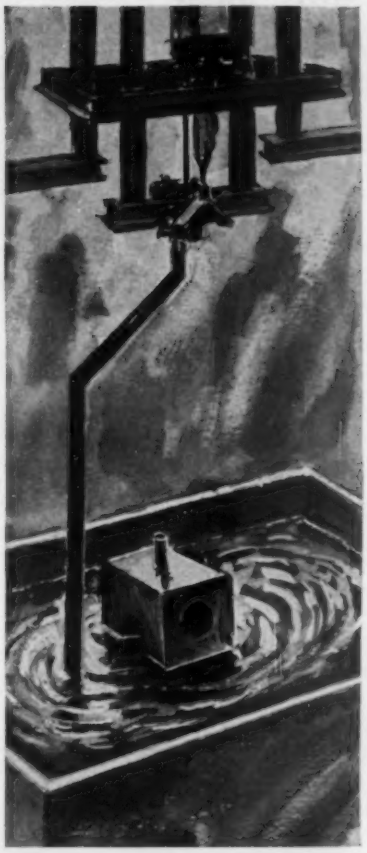
Excessive absenteeism and promotion

Unlike love and marriage, they do not always go together. But sometimes an employee cannot be deprived of a promotion because of his poor attendance record.

Absence has never made the heart of an employer grow fond of the worker. Excessive absenteeism has cost many a worker a promotion where job attendance is an important factor in a new job. Now comes Arbitrator Edwin R. Teple with a word of caution for *management*.

In effect, he ruled that a senior employee, otherwise qualified for the promotion, cannot be deprived of it because of past excessive absenteeism that "is largely the result of specific illnesses which appear to have terminated." Here's the rub: A supervisor can't always be sure that the illness has been cured.

Does Teple's ruling mean that a candidate with an illness record must be referred to the company doctor for such a determination? Probably a good idea. A doctor's pronouncement might carry weight with an



GET THE DROP ON COSTS....

The unique vertical drop section in Rapistan Power-and-Free overhead trolley conveyor gives a new answer to old problems.

It lowers parts to assembly height from overhead storage. It serves processing and finishing stations.

It saves floor and tank space, because a dip tank need be only big enough to contain the part, regardless of dip cycle length.

It saves space wherever changes in elevation are required.

For information on the vertical drop section and other unique features of Rapistan Power-and-Free conveyors, write to Rapistan-Keystone, Inc., 548 Rapistan Building, Grand Rapids, Mich. Ask for Bulletin 2365.

Rapistan®

OVERHEAD CONVEYORS

Circle 517 on Reader Service Card

Here, DOUBLE DUTY Use of a

SPENCER VACUUM SYSTEM

At Charles W. House & Sons, Inc., Unionville, Connecticut, a single Spencer vacuum system contributes to plant efficiency and operating economy in two important ways, by:

SPEEDING PRODUCTION—At the machines where washers are stamped from felt strip, vacuum picks up the washers, conveys them to containers and carries off the fuzz and dust—leaving washers clean.

SIMPLIFYING MAINTENANCE—Cleaning is quick and thorough with Spencer vacuum. And because dirt and litter is carried off through an enclosed piping system, there's no hazardous, unhealthful recirculation of dust or lint.

For a no-obligation analysis and suggestions on how Spencer vacuum may be able to meet your production, conveying or maintenance needs, write outlining your particular problems.

Request Catalogs No. 155B "Spencer Vacuum", and No. 143-B "Pneumatic Conveying".

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

For more facts Circle 518 on Reader Service Card

Begins on page 200

arbitrator. However, the real significance of this award seems to be: If you are inclined to pass over a candidate because of his past absentee record, look into the reasons for his absence. Are they likely to continue? What is the prognosis?

Refusing overtime

Employees who refuse overtime during contract negotiations can be disciplined by employers.

In the Prudential case, which went before the U. S. Supreme Court, the union pulled almost every trick in the book to harass the company during contract negotiations. It was okay, ruled the court. "The use of economic pressure by the parties is part and parcel of the process of collective bargaining."

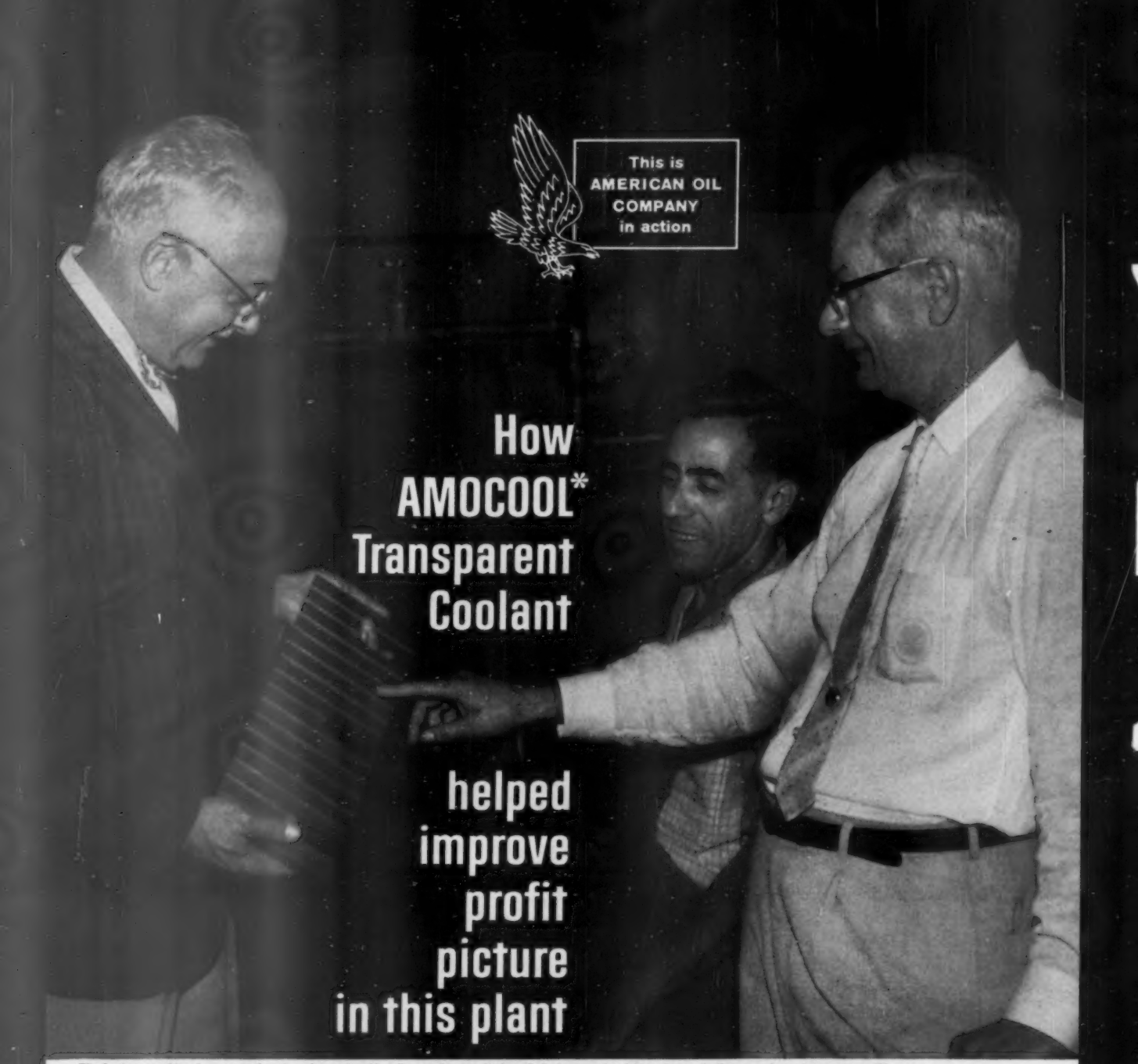
However, Supreme Court rulings apparently aren't gospel—not yet, anyhow. In a recent situation, to exert economic pressure during a negotiation, five employees (all union officials) refused to work overtime. All were disciplined by the company. The NLRB General Counsel refused to sign a complaint against the company. It's an unprotected activity, he ruled, basing his conclusion on pre-Supreme Court rulings—which had not been upset.

Hiring replacements

No need to hire them with the proper management rights clause.

Arbitration award after award demonstrates that management's Monroe Doctrine should be the management rights clause. A company can inch toward a union's demand in every other area—but when it comes to this basic clause, management should call a halt—resist every bit of the way.

A recent illustration of how handy this clause can be involved the death of one maintenance worker and the retirement of another. The company refused to fill the jobs. The union said it had to. In its arguments before the arbitrator, the union pulled out all the stops. Two big blasts: Promotional opportunities were reduced, and a lot of skilled workers



How AMOCOOL* Transparent Coolant helped improve profit picture in this plant

Eliminate reworking because of rust, reduce wheel loading and extend intervals between wheel dressings; do these and you increase profit per unit, explains Detroit Edge Tool president, Dan Ebbing, to P. E. "Pappy" Stratton of American Oil. Sam Vineh, operator, looks on.

by PAUL E. "PAPPY" STRATTON

About the Author.

"Pappy" Stratton has been providing technical help on lubrication and metalworking problems to customers in the Detroit area for nearly all of the twenty-five years he has been working for the company. In addition to having this store of practical experience to help him, Pappy has completed the Company's Sales Engineering School.

☆ ☆ ☆

By using a soap-base grinding compound, Detroit Edge Tool Company was getting excessive corrosion and rust on work and grinding machines. Oil vapor was collecting on machines and on the ceiling, causing dirty working conditions. Most important, high wheel loading was causing frequent down-time for wheel dressings.

We worked out a test program on AMOCOOL Transparent Coolant with the management. On our first test on one surface grinder, feed pressure was cut substantially while at the same time metal removal was increased.

The cost of reworking parts to remove rust was eliminated. Time required to clean machines to get rid of the odor was cut in half. Less wheel loading and fewer wheel dressings have upped production and reduced costs. Our test program paid out in an improved profit picture. All grinding and drilling equipment has been converted to AMOCOOL Transparent Coolant.

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Would you like this kind of technical help to assist you in improving profits? Get it by calling the American Oil Company office nearest you.

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For more facts Circle 519 on Reader Service Card

What's so fresh about outside air?

It's about time we stopped talking about outside air as being "fresh." Air pollution in most of our urban and industrial areas is so great you can introduce more problems than you solve by bringing in 25% or 35% outside air. The day may come when building codes read, ". . no *more* than x% outside air" rather than ". . no less than."

● Air brought in through particulate then activated charcoal filters is delivered clean and odorless—fresher than any outside air. And by recirculating inside air through the activated charcoal filters you can design as close to 100% recirculation as you wish. An added bonus—you can cut the initial investment and the operating costs of your heating and cooling equipment.

Give us the details of your application and we will supply specific data and samples—or write for Literature Group T-373.

Barnebey-Cheney, Columbus 19, Ohio.

activated charcoal air purification

Barnebey Cheney

Begins on page 200

LABOR RELATIONS

in the shop were handling low and "degrading" work.

But the management rights clause came to the rescue. It said that management had the right to manage the business and plants and to direct the working force. It wasn't obliged to fill these two jobs (or any others, for that matter). On the "degrading work" point, the arbitrator simply indicated that skilled workers were being paid top rates for menial jobs. What's wrong with that, he wanted to know? At least they were getting the "reward of full compensation."

Foremen as workers

De minimis non curat lex, is how lawyers say in Latin that it's not worth bothering about. In this case, an arbitrator used it to characterize the amount of production work performed by a foreman.

Perhaps it was the $2 or $3—or just the principle of it—but a southwest local of the Oil, Chemical and Atomic Workers Union ended up paying more than it was worth in arbitration costs—and lost to boot. In union contract language, no foreman was to do any work which would cause an employee "to suffer layoff or loss of pay." Emergency constituted an exception. During a midnight shift a foreman spent an hour or so fixing up a misbehaving sump pump. He should have called in a mechanic, argued the union. An emergency, responded the company.

No emergency, ruled the arbitrator. Sure, production might have been stopped by the faulty pump, but no property would have been damaged [Editor's query: Loss of production is not loss of property?] and no employee was endangered. Nevertheless, he ruled for management on the basis of "de minimis"—if a mechanic had handled the job as the contract required, he would have earned only a few dollars—not enough to talk about.

(Items in this section are developed from full citations published by the Bureau of National Affairs, Inc., Washington, D.C., and from other sources.)

For more facts Circle 520 on Reader Service Card

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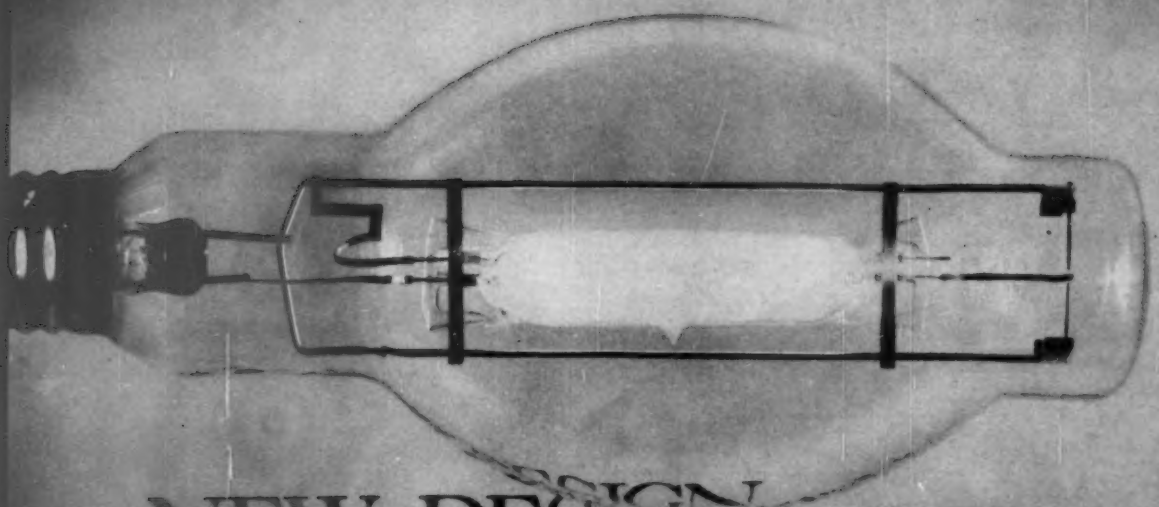
WITH WESTINGHOUSE



NEW DESIGN GIVES 25% MORE LIGHT

NEW WESTINGHOUSE "LIFEGUARD" MERCURY LAMPS...

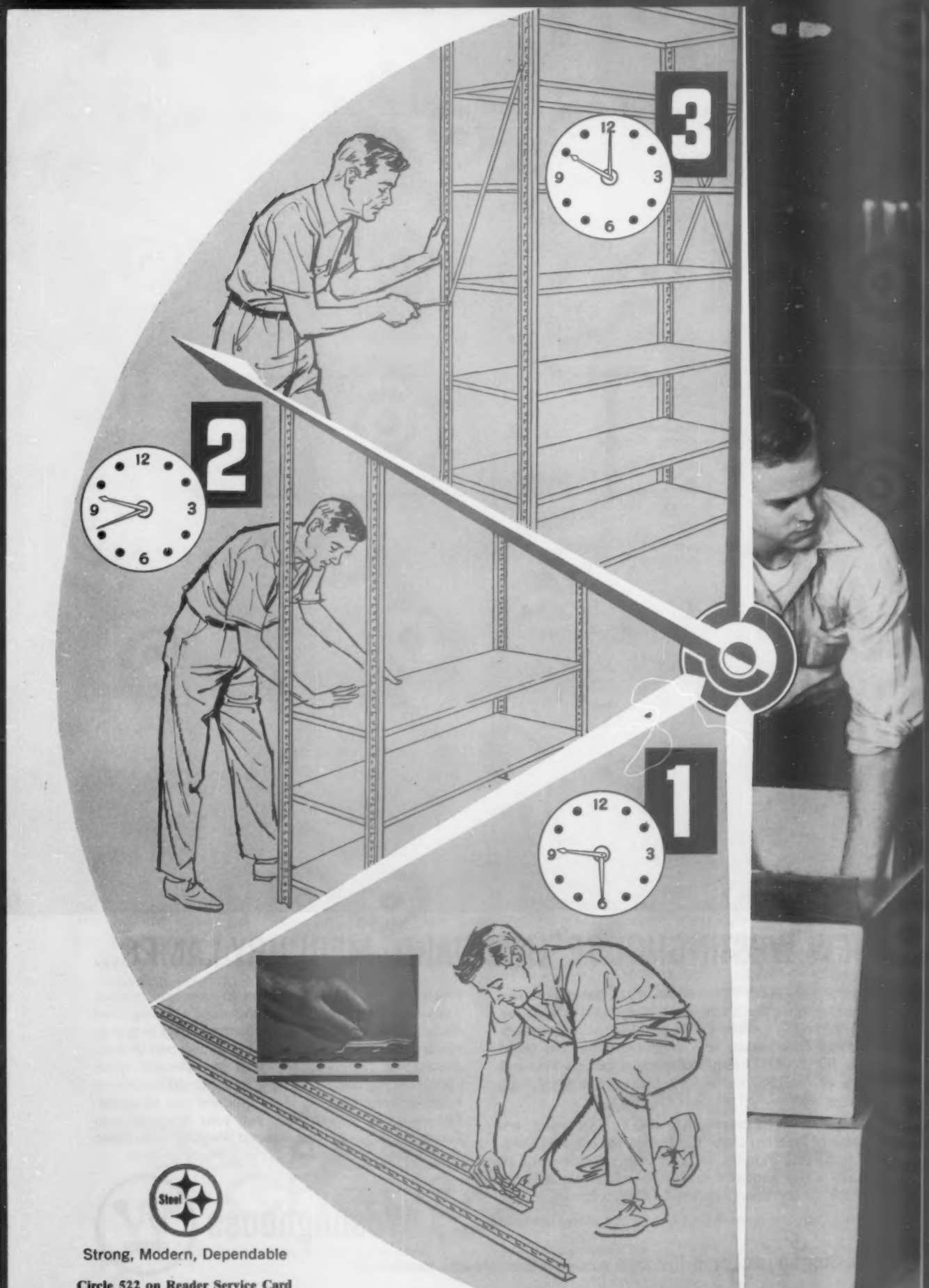
Give you the most light per dollar . . . because a new Westinghouse electrode virtually eliminates arc-tube blackening . . . major cause of mercury lamp deterioration! As a result, new Lifeguard lamps are rated at a full 12,000 hours economical service life, and give up to 25% more light throughout their 70% longer life.

Lifeguard lamps (available in 100 to 1000 watts) are made of Weather Duty[T] hard glass for extra dependable service indoors, or out. They will not crack or craze when exposed to rain, sleet, snow, thermal shock, or corrosive industrial gases.

The Lifeguard lamp is just one of the many types of Westinghouse lamps designed to save you money. Take advantage of the Westinghouse Lighting Cost Reduction Plan and cut your lighting costs in one or more of the following ways: (1) Reduced cost of lamp purchases; (2) Reduced lamp replacement labor costs; (3) Increased lighting level for the same or lower power costs; (4) More efficient use of power. For complete information, call your Westinghouse Lamp Agent . . . or your nearest Westinghouse Sales Office. You can be sure . . . if it's Westinghouse.

Westinghouse

Westinghouse Lamp Division, Westinghouse Electric Corporation, Bloomfield 2, N.J.



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MORE SHELF SPACE IN MINUTES!

REPUBLIC CLIP SHELVING

Open a package of Republic Clip Shelving components and you have everything you need to get "engineered" storage space in minutes! No special tools needed . . . and the completely interchangeable parts go together, fast, in whatever storage arrangement you want.

Here's how it works:

1 Lay out two angle posts. Slip Republic Compression Shelf Clips into first and second slots from bottom. (Finger pressure alone puts the clips in place . . . no tools needed.) Place end flanges of first shelf over clips and tap into place with the heel of your hand. Now add two posts at the front, again tapping the shelf down over clips.

2 Stand the assembly upright. Place shelf clips at desired shelf levels. Slip shelves into place, installing top shelf last, flush with post tops.

3 Attach back sway braces and side sway braces . . . and your new, "tailored" shelving is ready for use! Average erection time for a single unit—thirty minutes!

The complete line of Republic Clip Shelving includes shelves, parts, and accessories for every storage need, standard or special . . . and you can rearrange Republic Clip Shelving just as fast and often as your needs change! Another big advantage, individual shelves can be moved without disturbing adjacent shelves.

When you need more shelf space, and you need it in a hurry, remember Republic Clip Shelving. You can get it in a hurry too, from your local Republic distributor. Call him, or send the coupon for literature.

REPUBLIC STEEL

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We're interested in "instant storage" with Clip Shelving. Send literature.

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It's news! Taylor electrically flash welds ALL SIZES of TM Alloy Steel Chain! Every weld is positive, free of oxides and foreign materials. In addition, all TM Alloy Slings have patented Tayco Hooks—undergo rigid quality control, link-by-link inspection and scientific testing. These factors plus a signed Test Certificate assure maximum, trouble-free service and lower costs! Call your distributor or write direct for Bulletin 14-A today.

Chain is our specialty — not our sideline!

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S. G. TAYLOR CHAIN CO., Inc.
General Office: Hammond, Indiana
Plants: Hammond, Ind., and Pittsburgh, Pa.

CATALOG NEWS

For more data, circle item numbers on Reader Service Card next to back cover.

BUILDING

1—Elevated flooring. This 4-page catalog describes Strato-Floor, a new elevated flooring for use in electronic installation, or wherever extensive cabling and wiring systems need under-the-floor accessibility. *Strato-Floor, Inc.*

2—Small metal buildings. Self-supporting A and AL Series, and standard shed pre-engineered units that meet small building requirements are discussed in 6-pager (No. BD-260). Includes accessories. *The Parkersburg Rig & Reel Co.*

3—Ceiling panels. Catalog AIA 31-F-231 (4 pages) tells about design of luminous ceilings with Metalcel steel panels. They're strong, hexagonal-celled, with low surface brightness and high efficiency. Specifications. *Hupp Corp.*

4—Steel buildings. This 4-pager (7112) presents advantages of steel, clear-span, and pre-engineered buildings: fast erection, low cost, design flexibility, easy expansion. Also covers Rib-Drain roofing. *Ceco Steel Products Corp.*

MAINTENANCE

5—Lubrication equipment. Catalog 80 (32 pages) discusses centralized lubrication systems and the application of fully automated, semi-automatic, and manual methods of operation. *Lincoln Engineering Co.*

6—Cleaning system. Small-sized 4-pager has data on mobile, transistorized ultrasonic system for faster, easier cleaning of plastic, glass, or metal light-shielding media. *Ender-Monarch Corp.*

7—Precipitators. Latest techniques and equipment for air pollution control are presented in Bulletin 500 (12 pages). Shows precipitators for automated controls and high-efficiency silicon rectifiers. Photos. *Research-Cottrell, Inc.*

8—Gloves. This 8-pager helps select gloves for handling nearly 400 chemicals. Chart rates comparative wear and resistance of neoprene, neoprene-coated, Koroseal-coated, rubber gloves. *B. F. Goodrich Industrial Products Co.*

9—Dust filter. Here are details on design and construction of company's RJ dust filter. Bulletin G-331 (8 pages) has installation photos, capacity table, dimensions and specifications of single and multiple units. *The Day Co.*

ELECTRICAL

10—Capacitor service guide. This 20-pager (No. C914) lists motor-starting electrolytics and Clorinol-impregnated motor-run capacitors for a-c applications. Data on interchangeability, replacement, and service. *Sprague Products Co.*

11—Controlled motor speed. Form F-1952 (8 pages) describes 12 industrial systems of correct speed-control actuation. Tells how to save development time and money with automatic speed control. Photos. *U. S. Electrical Motors, Inc.*

12—Infra-red heating. Here's a 4-pager (61-124) on new high-intensity (up to 3000 F.) radiant-heat equipment. By utilizing fluid cooling, quartz lamp sources furnish instant heat, immediate shut-off, compact design. *Fostoria Corp.*

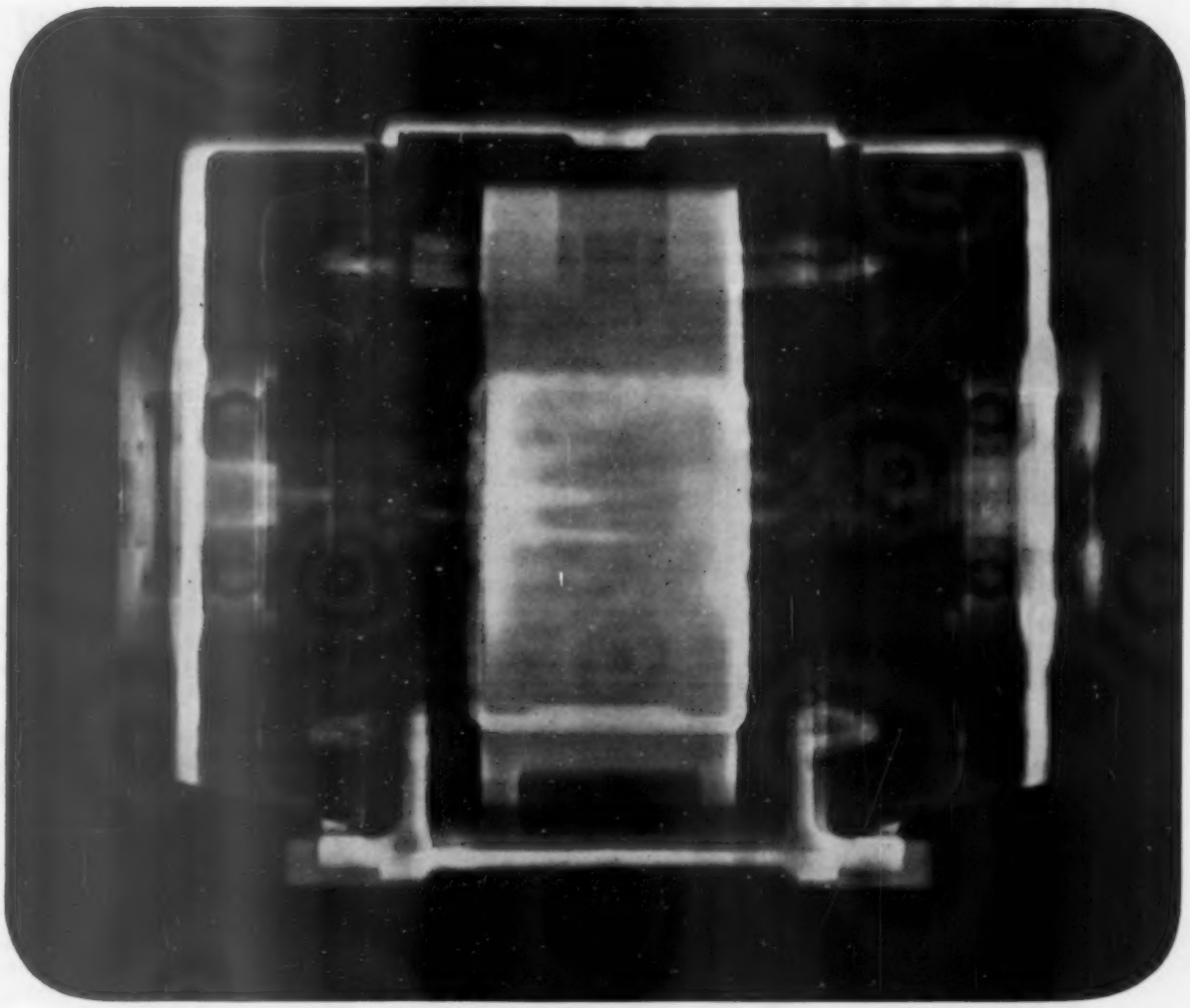
13—Miniature pushbuttons. A revised bulletin (GEA-7127A, 12 pages) shows complete line of industrial miniature oil-tight pushbuttons in many color combinations. Also describes panel space savings, features. *General Electric Co.*

14—Transite conduit. Two types of asbestos-cement conduit for installation in concrete and direct burial application are described in a 12-pager (TR-247A). Includes reference data, table of shipping weights. *Johns-Manville.*

Turn the page

ALLIS-CHALMERS

A-1508



Actual radiograph of a 5-hp open-type motor taken with a 24-million volt Allis-Chalmers Betatron.

X-ray view of motor health

Invisible standards of perfection increase life expectancy of every Allis-Chalmers motor

The exceptionally long performance of A-C open motors proves the value of thinking *beyond* established standards of design . . . of taking "significant new achievement" as the ideal.

This ideal led to many refinements for A-C open motors: double-shielded bearings that keep dirt out and allow controlled migration of grease, permanently numbered leads for easy identification and connection, and heavy-duty cast iron frames that resist corrosion and keep rotating parts perfectly aligned.

For totally-enclosed, open-type and *Super-Seal* general purpose motors, and electrically or mechanically modified definite-purpose motors, choose the motor built to invisible standards of perfection. Choose A-C. Special application help available.

Call your nearby A-C representative. Or write **Allis-Chalmers,** *Industrial Equipment Division, Milwaukee 1, Wis.* Super-Seal is an Allis-Chalmers trademark.

For more facts Circle 524 on Reader Service Card

TENNANT Industry's most complete line of POWER SWEEPERS

TENNANT Model 40 Sweeper

HERE IS America's most complete and widely used line of power sweepers . . . for plants of all sizes.

If your plant is not already using a TENNANT Sweeper, you'll be surprised at its performance . . . and the savings it can bring you.

FOR CONGESTED AREAS—A compact NEW walk-behind Sweeper (Model 40). Cleans 34" path, turns in its own tracks. *Equals "big sweeper" performance for CLEAN sweeping!* Sweeps 8 to 18,000 sq. ft. per hour in most plants . . . or 2 to 5 times faster than a man with a broom. Very powerful brush-and-vacuum system: out-performs any other sweeper of its size for clean, dust-free work. Low priced. Available in gas, LP-gas, and battery-powered models.

FOR SMALL PLANTS — Versatile space-saving Sweeper (Model 53) cleans 40" path on the run. Travels at 1½ to 5 mph, *sweeping 3 to 7 times faster than is possible by hand.* Rider-type; easy to use. Combined brush and vacuum system instantly removes chips, sand, debris, dirt and dust that pushbrooms can't pick up.

Compact design and easy steering make the "53" ideal for both congested and open areas. Auto-type steering, clutch, and brake. Often pays for itself in 9 to 14 months. Available in both gas or LP-gas models.

TENNANT Model 53 Sweeper

TENNANT Model 85 Sweeper

FOR HEAVY DUTY SWEEPING. New Model 85 has no equal for rugged, 'round-the-clock sweeping. Sweeps an extra-clean 53" path; picks up heavy litter and fine dust. Cleans up to 100,000 sq. ft. per hour in open areas, yet is "aisle-designed" for fast round-trip sweeping of most aisles.

Huge filter (66 sq. ft.) has 3 times more dust-capturing capacity than elsewhere available. Filter-shaker discharges dust into 12 cu. ft. hopper at touch of a button. Fan and brushes rotate at *constant speed.* Climbs steep ramps. Gas or LP-gas.

FOR MAXIMUM CAPACITY, here is the giant Model 100. *Has 3 to 4 times the capacity of smaller sweepers.* Cleans 7' 4" path, yet has turning radius of only 10' 2". Hydraulic dump hopper holds almost 2 yards.

Excellent dust control and huge capacity make it ideal for yards, docks, salvage work, large aisles, etc. Nothing else like it!

TENNANT Model 100 Sweeper

Write today *for illustrated bulletins on Tennant Power Sweepers. Get details on how to reduce your sweeping costs.*

G. H. TENNANT COMPANY, 705K N. Lilac Drive, Minneapolis 22, Minnesota

SPECIALIZED MAINTENANCE EQUIPMENT

POWER SWEEPERS • FLOOR MACHINES • SCARIFIERS • ROOF SCRAPERS • CONCRETE ROUTERS

214 For more facts Circle 525 on Reader Service Card

Begins on page 212

CATALOG NEWS

For more data, circle item numbers you want on Reader Service Card.

15—Wiring raceways. This detailed 16-page manual (L-24) shows how to use hollow-core precast concrete sections as raceways for wiring. No conduit or armor needed. Diagrams. *The Flexicore Co., Inc.*

16—Rectifiers. Bulletin 400 (4 pages) lists vacuum power stacks and cartridge-type process rectifiers. Sections illustrated show selenium assembly and Selenium Slim cartridge rectifiers. *Semiconductor Div., Syntron Co.*

PRODUCTION

17—Machine tools. "Press Modernization" (Bulletin ML-200) is an 8-page step-by-step analysis of power transmission conversion of presses. Describes economic and engineering advantages. *Fawick Corp.*

18—Machine tool controls. Booklet on numerical controls (32-pages) explains the meaning and use of punch tape in machine tool applications. Data includes photos, graphs, charts, and tables of cost savings in machining. *Friden, Inc.*

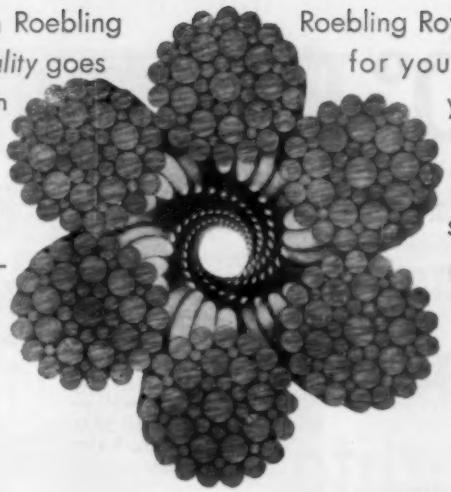
19—Tools. New 36-page carbide tools catalog features specifications and other data for maker's carbide-tipped tools, blanks, inserts, and holders. Useful aids are grade selection and non-stock item pricing. *Besley-Welles Corp.*

20—Meters. Form 566-14 presents industrial meters in stainless steel and bronze for accurate processing of liquids. The 28 pages contain data on meters with registers for direct reading, dial indicating, and totalizing. *Neptune Meter Co.*

21—Tools. This 50-page catalog features new sizes and styles of tungsten carbide tooling, including disposable inserts and profile toolholder for copying lathe. Includes specifications, other technical data. *Sandvik Steel, Inc.*

Turn the page

Profit from the inside story on Roebling Royal Blue Wire Rope—the *quality* goes all the way through. Extra high strength in conjunction with uniformity of rope construction means unequalled resistance to wear and tear — and a whopping increase in service life. That is why every inch of Roebling Royal Blue pays off on the job for you. Get all the details from your wire rope distributor, or write for free booklet to Roebling's Wire Rope Division, Trenton 2, New Jersey.



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A demonstration of WHEELABRATOR'S

VITAL VALUES

Development of a residential neighborhood near an Eastern perlite manufacturing plant, meant the firm could no longer exhaust fine perlite dust into the air. With temperatures of 550°F involved, only a dust collector utilizing glass fiber tubes would handle the problem. To this challenge Wheelabrator engineers brought the Vital Experience of having used successfully more glass fiber tubes than any other dust control equipment manufacturer. With the installation of a Wheelabrator Glastube Collector, local air pollution control requirements were satisfied. You, too, can depend on Wheelabrator's Vital Values to assure solution of your Dust problems with optimum efficiency and economy.

Fine perlite dust in gas up to 550°F is captured in this Glastube Dust Collector to eliminate an air pollution problem. Write today for detailed data on this hot gas application.

VITAL VALUES FOR INDUSTRY

WHEELABRATOR
DUST AND FUME CONTROL

WHEELABRATOR CORPORATION, 374 S. Byrkit St., Mishawaka, Ind.
In Canada, WHEELABRATOR CORP. of Canada, Ltd. P.O. Box 490, Scarborough, Ont.

Begins on page 212

CATALOG NEWS

For more data, circle item numbers you want on Reader Service Card.

22—Mixers. In 12 pages, Bulletin 194 presents detailed description of factors involved in portable mixer selection. Maker's line can be gear, direct motor, or air-power driven in ranges from ¼ to 3 hp. Photos. *Cleveland Mixer Co.*

23—Process material handling. These 12 pages of Bulletin G-3E describe process material conveying systems. Points out specific design and performance characteristics of pumps, compressors, coolers and preheaters, and fans. *Fuller Co.*

INSTRUMENTS AND CONTROLS

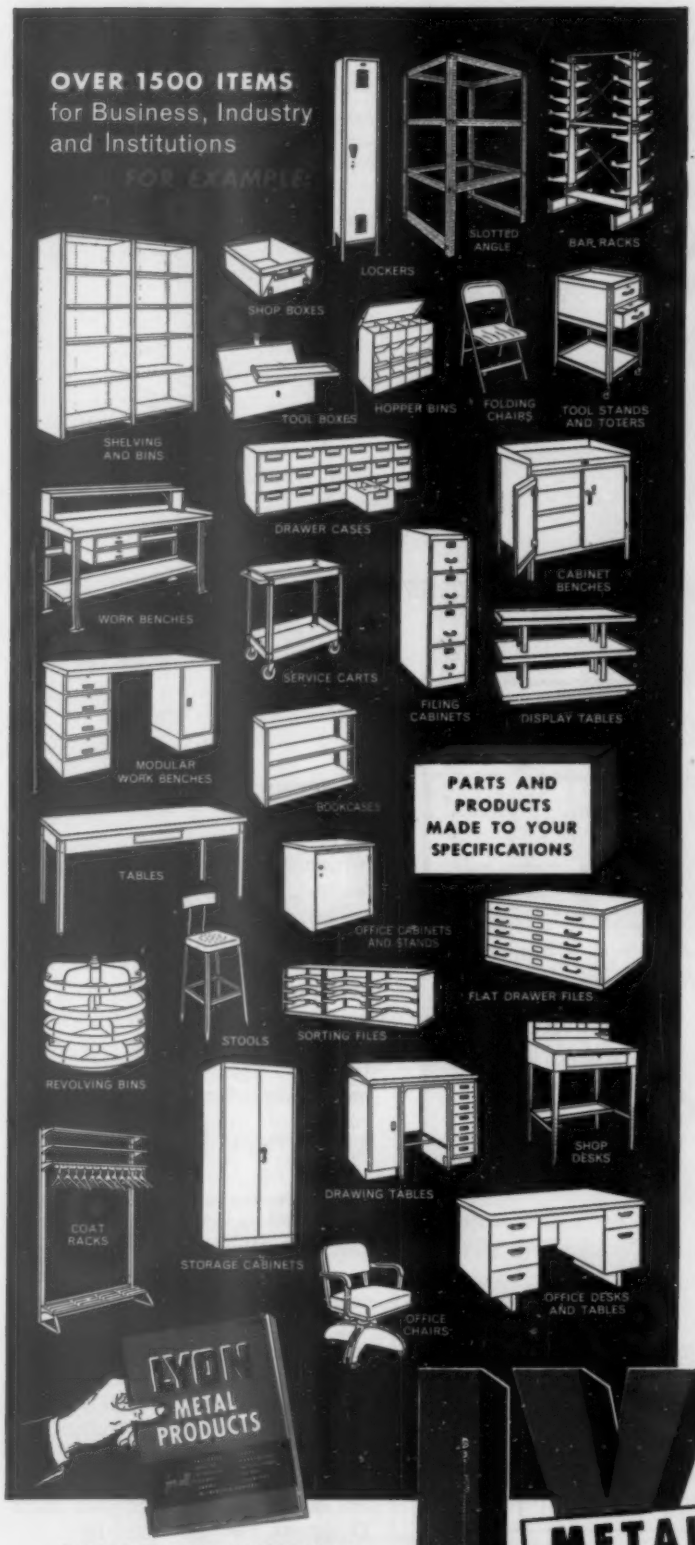
24—Testing instruments. Bulletin Z-54 (8 pages) describes portable units, including matched a-c and d-c meters, current transformer for use as a-c multiplier. Also covers a-c clamp volt-ammeters, ohmmeters. *Daystrom, Inc.*

25—Gauges. Descriptions of compact, easy-to-read V5 gauges for indicating draft, pressure, and pneumatic impulses from transmitters are given in Catalog 321.11 (12 pages). Response curves, diagrams, photos. *Republic Flow Meters Co.*

26—Temperature regulator. Ratings, dimensions, ranges, applications, and operating details are contained in an 8-pager (TCV-1). Available in self- or pilot-operated models from ¼- through 6-in. sizes. Sizing charts. *OPW-Jordan.*

27—Testing machines. Bulletin 63 (36 pages) has technical data on standard split cabinet electro-mechanical units in capacities to 1,000,000 lb. Describes Selectodrive system for testing speeds. *Tinius Olsen Testing Machine Co.*

28—Microhardness tester. Here's a bulletin that tells about tester for direct, standard readings within 15 seconds by measuring resistance hy-



THIS CATALOG ILLUSTRATES THE WORLD'S MOST DIVERSIFIED LINE OF STEEL EQUIPMENT *IT'S FREE!*

5 TO 1 in '55

AND NOW IT'S 7 TO 1

In a preference survey made by an independent organization back in 1955, key men in companies throughout the country gave Lyon 5 times more first choice votes than any other steel equipment manufacturer.

In a comparable survey made in 1960, Lyon's first choice margin jumped to 7 to 1! And Lyon received more exclusive mentions than the next 22 companies combined!

Your nearest Lyon Dealer offers the world's most diversified and *most preferred* line of steel equipment—quality protected to give you the most for your investment.

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General Offices: 912 Monroe Ave., Aurora, Illinois
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Dealers and Branches in All Principal Cities

LYON® METAL PRODUCTS

this PAYLOADER® operator

runs entire batching-mixing plant

Consumers Cooperative Association, Kansas City, Mo., demonstrates how an adaptable "PAYLOADER" tractor-shovel, plus ingenuity, can cut the cost of bulk material handling in general and solve a batching and mixing problem in particular. This organization operates 12 bulk fertilizer plants in a nine-state area. Each of these plants mixes fertilizers—from a ton to a truckload—to the customer's specifications while he waits.

This fast, accurate and efficient batching operation begins with the "PAYLOADER" and its precise, hydraulic bucket control with which the operator takes the separate ingredients from their bins and weighs each one into a 1-ton scale hopper. By means of air-control valves and push-buttons grouped within his reach, he dumps the hopper, elevates the batch to the mixer, starts the mixer and dumps the fertilizer through a chute into the waiting truck. As soon as the scale hopper is emptied, he loads it with another batch so that the process is practically continuous, and up to 20 tons of fertilizer can be mixed and delivered per hour.

Your Hough Distributor has a "PAYLOADER" model—up to 12,000 lbs. operating capacity—to fit your job, indoors or outdoors, plus the finest service and parts facilities in the business.

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755 Sunnyside Avenue
Libertyville, Ill.
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Send "PAYLOADER" bulletin "Industrial Material Handling from A to Z"

Name
Title
Company
Street
City
State

9-A-2

Begins on page 212

CATALOG NEWS

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drostatically. Small precision parts can be tested accurately. *Newage Industries, Inc.*

29—Metal detectors. "The How and Why of RF Metal Detectors," (8 pages) explains environmental and operational factors that affect sensitivity of radio frequency detectors. Shows models of Metabloc control units. *Morehouse Machine Co.*

MATERIAL HANDLING

30—Electric lift trucks. Two 4-pagers: No. 3000 covers Model M-3 with arm-length, eye-level maintenance; No. 4000, Model M-4, with arm-length, eye-level control center. Specifications, capacities. *James Campbell Smith, Inc.*

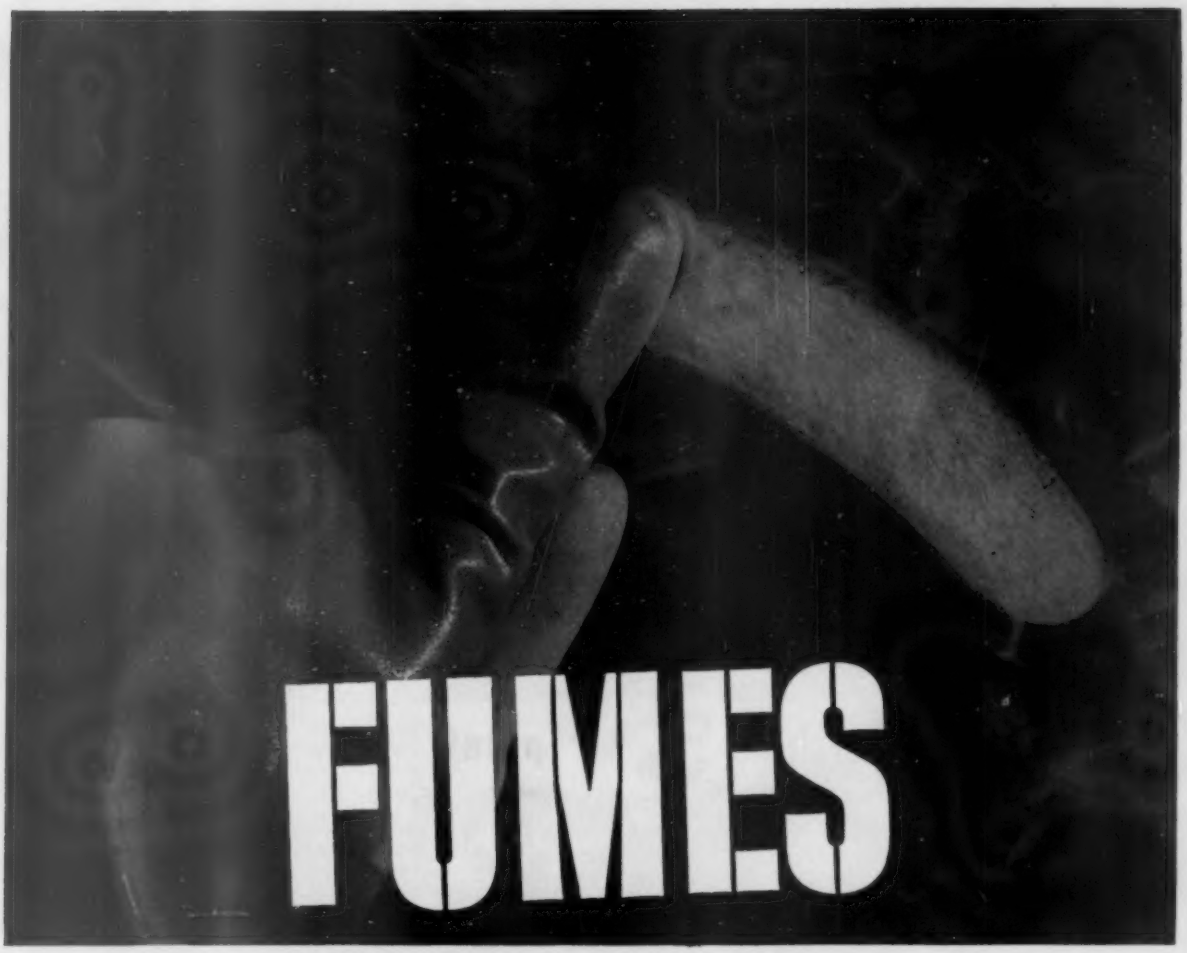
31—Powered conveyors. Here's an 88-page reference book with data arranged so you can find the information you want easily—design features, standard applications, engineering details, specific conveyor components. *Lamson Corp.*

32—Floor trucks. Catalog 58A (28 pages) covers two-wheel trucks, dollies, and barrel-handling equipment. Includes specifications for 130 models in many sizes with wide variety of running gears. Photos. *Nutting Truck and Caster Co.*

33—Vibrating screens. Descriptions, data, and specifications are contained in Bulletin VS-61561 (32 pages). Products covered: rotary vibrator, Grizzly Bar, pulsating magnet, and other screens; screening feeders. *Syntron Co.*

34—Remote handling system. Lightweight mobility, precise control, and other advantages of vehicular mechanical arm system (Little Ranger) are described in 4-page data sheet. Diagrams. *General Mills, Inc.*

35—Handling equipment. This 20-pager (SP-4070) presents company's complete line of fork and



WHEN THE PROBLEM CALLS FOR PAINT THE BEST ANSWER

IS INVARIABLY **Barreled Sunlight** Paints

ENGINEERED

Take a look at the effect process fumes have on painted surfaces in your plant. Unsightly discoloration marks their presence. Next comes corrosion that can tear the hide off the toughest building material and send your maintenance budget "up in smoke".

Before this happens, however, you can take steps to end this costly deterioration. Your first move is to call in a Barreled Sunlight Engineered Paint representative. This man *knows* how paints react to various industrial fumes. He knows which paints best withstand their yellowing and corrosive action. He can also show you — with an "on-the-wall" demonstration — how Barreled Sunlight Paints save on application costs, go on faster and easier with fewer coats.

Give this man an opportunity to help solve *your* specific paint maintenance problem. The coupon below will put him in touch with you promptly and without obligation.

FREE! BARRELED SUNLIGHT PAINT "SLIDE GUIDE"

Contains complete information on Barreled Sunlight Exterior and Interior Finishes, Colors, Primers, and Thinners plus full application and special resistance data.

BARRELED SUNLIGHT PAINT COMPANY
1249 Georgia Avenue, Providence 5, Rhode Island

I want help in selecting the right paint for a specific job in our plant.

☐ Please have your representative call me to arrange an appointment without obligation.

☐ Please send me your new "Slide Guide" to Barreled Sunlight Paints.

Name.....

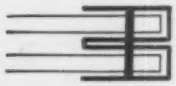
Title.....

Company.....

Street.....

City.....*Zone*..... *State*.....

3 ways to get maximum protection with minimum packaging



ENDS

A single piece of corrugated board and steel strapping at each end of these 10-foot lengths of tubing make a neat, square package that places effective protection where it is needed, takes little material, and is easy to handle, stack, store and ship.

Two men, each with a Signode M2 power strapping machine, stack, cap and strap 270 packages per day, as against 130 packages per day with hand strapping tools.

EDGES

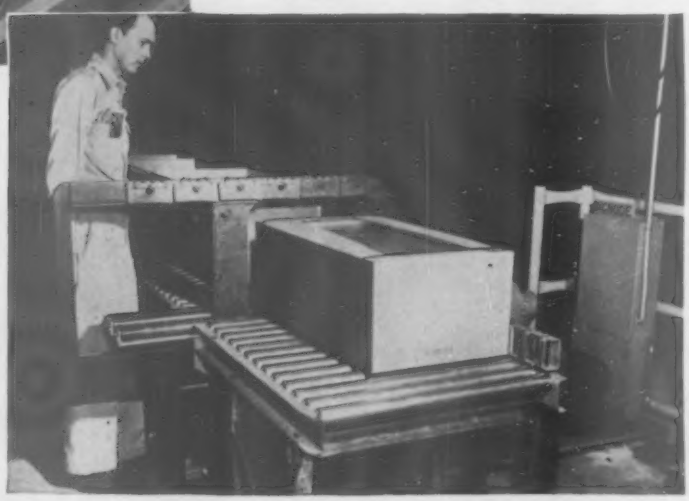
Long sheets of laminated plastic are paper wrapped, then edges are enclosed in strips of corrugated. Steel strapping is automatically applied at just the right tension to make a sturdy unit package. Savings in packaging costs are substantial, protection is practically perfect.

Operatorless strapping with a Signode M20 power strapping machine. Conveyor is powerized. Strap placement is controlled by a conductive ink mark on the package.

4 SIDES

Metal shelving and components are strapped in these containers that are open top and bottom. They are typically 3′ long, 1′ high, and from 9″ to 36″ wide. The same machine straps bundles of angles or posts that are only 3″ to 4″ square. Production is up almost four times, package unit cost is down, protection excellent.

One man and this foot-pedal-operated power strapping machine strap over 1100 containers a day. The machine has an adjustable strap chute to assure maximum strapping speed.



■ These three ways to save suggest what is accomplished when the strength of quality steel strapping is used with skill and imagination. Write for free Minimum Packaging Idea Kit.

First in steel strapping

SIGNODE
STEEL STRAPPING CO.
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Offices Coast to Coast, Foreign Subsidiaries and Distributors World-Wide
In Canada: Canadian Steel Strapping Co., Ltd., Montreal • Toronto

For more facts Circle 531 on Reader Service Card

Begins on page 212

CATALOG NEWS

For more data, circle item numbers you want on Reader Service Card.

powered hand trucks, straddle carriers, towing tractors, attachments, and container handling units. Application photos. *Clark Equipment Co.*

36—Storage racks. Here's a 4-pager that introduces new Series 4000 Bild-A-Rack. Major feature: It requires no special tools, no extra equipment, no cutting—and there's no scrap. Comes completely packaged. *The Paltier Corp.*

37—Automation accessories. Catalog 101A (4 pages) describes new electric vibrators that keep hard-to-flow materials moving freely in hoppers. Vibratory pedestal drivers (also new) are covered. Photos of units. *Automatic Feeder Co.*

AUXILIARY

38—Fans, air washers. The handling of corrosive fumes with fans, air washers, and exhaust systems made of unplasticized, rigid PVC is described in 36-pager (F). Chemical-resistance data and diagrams. *Industrial Plastics Fabricators.*

39—Blowers. Catalog SP has 16 pages of information on cast-iron and fabricated steel blowers and exhausters for standard and special applications. Includes relation of inlet density to outlet pressure. (Erroneously listed as 6-pager in May FACTORY). *Lamson Corp.*

40—Air compressors. Unit-type compressors from ½ to 15 hp., and stationary models from 25 to 100 hp. are discussed in 4-page bulletin (SG-3). Tables of operating pressures, other technical details. *Westinghouse Air Brake Co.*

41—Fans, blowers. Specifications, performance chart, and applications are given in 4-page brochure (IAC J618). Describes principle of blade design to show how this series can produce up to 11,000 cfm. Photos. *Super Vacuum Mfg. Co.*

Turn the page

when a few missing items mean trouble...

Spiegel's Electrowriter® System saves one to three days on orders

Central Packing clerk at Spiegel, Inc. in Chicago writes stock-check order directly on Electrowriter Transmitter to...

...warehouse located sixteen city blocks away. Here, message is instantaneously recorded in writing on the Electrowriter Receiver. Stock clerk takes message, checks bins, writes back to Central Packing using the Electrowriter System.

Central Packing at Spiegel, Inc., Chicago, home of the Spiegel Catalog, processes over 6,000 mail orders every hour. A few incomplete orders can tie up space on the packing floor and cause delays for customers.

To verify open stock on missing items used to take up to five hours by house mail, often holding up shipment of an order until the next day or over a weekend. Now, with an Electrowriter System Central Packing keeps constant tab on open stock in three remote warehouses and verifies missing items in *less than 30 minutes.*

Achievement? Spiegel has maximized order handling, avoided congestion on the packing floor, and saved valuable manhours with its Electrowriter Communications System. Orders can not be lost or misplaced. A permanent, written record is obtained of every stock verification. And Quality Control personnel can check the disposition of any order at any time.

NOW..."Write By Telephone"*

You can "Write By Telephone" over regular dial networks* or private lines for alternate written message and voice service. Find out how your company can increase its efficiency and cut costs with Electrowriter Communication Systems. Send for complete information.

*Electrowriter instruments are accepted for use over local and long distance facilities of the Bell System, General Telephone System, and independent telephone companies.

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Multi-million-dollar vote of confidence in Kentucky

Armco Steel Corporation recently announced a $95,000,000 expansion program—a major portion to be at its Ashland, Kentucky plant.

Logan T. Johnston, President, Armco Steel Corporation

TODAY more than ever before in history, Kentucky offers the Nation's greatest industrial opportunities. *Why?* In January, 1960, Kentucky's Governor Combs and Lieutenant Governor Wyatt announced a multi-faceted program to supplement the State's abundant natural advantages for industry. *Today, every one of the many projected activities has actually been launched.*

Result: In the past 18 months more new plants and expansions have been announced or actually completed than in any like period in history. Armco Steel Corporation, for example, is spending a major share of $95,000,000 to expand its plant in Kentucky. Armco's president, Logan T. Johnston, says, "Kentucky has many advantages . . . natural resources, rail and water transportation, central location, and most important, Kentucky has hard-working, intelligent, self-reliant people. We like the business climate and we expect to grow with Kentucky."

Let us tell you about the many competitive advantages a Kentucky plant site can offer *your company*. Address: Lt. Gov. Wilson W. Wyatt, or E. B. Kennedy, Commissioner, Dept. of Economic Development, 500 State Capitol Bldg., Frankfort, Kentucky.

Kentucky offers many competitive advantages...

LOCATION—68.4% of Nation's population within 500 mi., 38.1% within 300 mi., 21% within 200 mi.

FINANCING PLANS – more industrial financing plans (five) than any other State in the Nation.

TRANSPORTATION FACILITIES – served by 4,000 mi. of track, 20,000 mi. of State-maintained highways, more miles of navigable rivers than any other State, seven major airlines.

POWER CAPACITY – sufficient public and private reserve capacity readily available to supply the needs of any new or expanding industry.

WATER RESOURCES – Kentucky has adequate ground and surface water to fulfill *all* present and future needs.

LABOR FORCE – survey of Kentucky's 1,000 largest manufacturers shows 94% consider their labor productivity from average to very high.

COAL RESERVES – third-largest bituminous coal-producing State with two large, widely separated fields.

NATURAL GAS – more than 90 of Kentucky's 120 counties have natural gas.

RAW MATERIALS – *Natural:* coal, natural gas, oil, limestone, silica sand, fluorspar, ball and fire clay, timber. *Manufactured:* chemicals, metals, plastics, coke, synthetic rubber, to name only a few.

RESEARCH FACILITIES – New Spindletop research facility is a three-way partnership: the State, University of Kentucky and private industry.

COMMONWEALTH OF
KENTUCKY
WHERE BIG THINGS ARE HAPPENING

Begins on page 212

CATALOG NEWS

For more data, circle item numbers you want on Reader Service Card.

42—Ventilators, heaters. Two 4-page catalogs: DB3-100 gives selection data on propeller-fan power roof ventilators. DB5-100 tells all about electric unit heaters with capacities from 1½ to 36 kw. Both provide selection data and photos. *Ilg Electric Ventilating Co.*

43—Air-moving equipment. Types and sizes of air-moving equipment for almost every requirement are described in Catalog 3780 (12 pages). Includes tables of speeds, dimensions, and other data for low- and high-pressure fans, and roof ventilators. *Diehl Mfg. Co.*

44—Roof ventilators. Bulletin CV61 (4 pages) has engineering and other data on low-silhouette centrifugal ventilators. Cutaway photo shows aerodynamically designed aluminum discharge vanes. *Western Engineering & Mfg. Co.*

45—Roof fan, inducer, blower. Three 4-pagers: No. 226 describes compact, rugged Cyclone roof fan. No. 234, heavy-duty mid-draft inducer (in 7 sizes). No. 236 gives details on belt- and direct-drive centrifugal blowers. *Stamford Fan Co.*

46—Air systems. Heating handbook titled "Design Considerations for Make-Up Air Systems" (DF-200, 8 pages) discusses industrial, commercial, and other specialized applications of direct-fired gas heating equipment. *Reznor Mfg. Co.*

MECHANICAL

47—Speed reducer. Catalog J-25 (32 pages) contains information on horizontal and vertical spiral-bevel reducers. Data cover basic types, applications, selection procedures, hp. and thermal ratings, dimensions, photos. *Hewitt-Robins.*

48—Seals, fasteners. This comprehensive 16-pager tells about company's entire line of explosion and high-pressure seals for switches and

quiet...

. . . not even a purr! It's this traditional quietness of Hoover ball bearings that best demonstrates *Hoover Quality* . . . your assurance of longer life, superior performance.

Hoover-Honed raceways are super-smooth, finished to microscopic accuracy. *Micro-Velvet* balls are accurate within millionths of an inch. Precision assembly is achieved through perfect matching of ball complements and raceways. When specifications call for finest quality specify *Hoover Quality* bearings. There is a wide range of types and sizes. Contact your local Hoover bearing specialist, listed in the Yellow Page Directory, or write to us.

Hoover-Honed and *Micro-Velvet* are Hoover Trademarks.

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Lifting Made Easy

HOISTS AVAILABLE FOR EVERY LIFTING JOB

1✓ ELECTRIC HOISTS for frequent lifting with pace setting speed

2✓ AIR HOISTS to lift fast where atmosphere conditions are hazardous, corrosive, extremely hot, dirty or wet

3✓ CHAIN BLOCKS for easy lifting where the work cycle is moderate

P:B Budgit Electric Hoists

Series "700" Load Lifter Electric Hoist

ELECTRIC HOISTS

P:B Budgit® Electric Hoists. 1/8 to 2 tons. Modern push-button hoists for regular service. Portable. Two fully enclosed automatic brakes. Spotting action is fast, accurate. 1/2-ton load can be lifted at 34 FPM. Hook suspension. Trolleys available. Standard models for intermittent service — AC, DC, and 12-volt battery types — have pull cord control.

Load Lifter® Electric Hoists. 1/2 to 15 tons. For heavy-duty and production line service. Safe 24-volts at the push button. Single and 2-speed control. A ton can be lifted at 60 FPM. Two automatic brakes. Types for lug or hook suspension; also with push, hand-geared or motor-driven trolley. Hi-hook model increases length of lift.

Budgit Air Hoist

Load Lifter Air Hoist

AIR HOISTS

Budgit® Air Hoists. 1/4, 1/2 and 1 ton. Compact, lightweight hoists for regular lifting service. Link and roller chain types. Explosion proof motor. Spark and corrosion resistant link chain models. Speeds infinitely variable to 75 FPM. Pull cord control. Safety hooks standard. Rigid mount type and push trolley available.

Load Lifter® Air Hoists. 1 to 15 tons. Wire rope type for heavy-duty service. Five cylinder motor for smooth operation at all speeds. Speed infinitely variable to 37 FPM. Pull cord control standard; throttle control available. Mechanical load brake adjusts itself. Lug, push trolley, and hand-geared trolley suspension.

Tugit

Budgit Aluminum Chain Block

Budgit Army Type Chain Block

CHAIN BLOCKS

Tugit® . . . the Lever-Operated Hoist. 3/4 to 3 tons. Light. Compact. Portable. Operates easily at any angle even in close quarters. Has countless uses in every industry. Spur-geared for highest efficiency. A 42-lb. pull on the handle lifts 2 tons. Spark and corrosion resistant models.

Budgit® Chain Blocks. 1/4 to 10 tons. For production or maintenance. Combine light, strong aluminum frame with spur-geared lifting and automatic load brake. 25 lb. pull on hand chain lifts 1/4 ton. Hook suspension standard. Trolleys available. Army-type Budgit has integral trolley that can be adjusted to fit several sizes of I-beams and permits high hook lift. Ask about spark and corrosion resistant models.

SOLVE YOUR LIFTING PROBLEMS. Call your nearby Shaw-Box Distributor for practical help in selecting the best type of overhead load handling equipment — hoist or crane — for each task. Or, write us for literature.

D

MANNING MAXWELL & MOORE INC. TRADE MARK

OVERHEAD LOAD HANDLING EQUIPMENT

Products of

MANNING, MAXWELL & MOORE, INC.

Shaw-Box Crane & Hoist Division • Muskegon, Michigan

In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario.

Begins on page 212

CATALOG NEWS

For more data, circle item numbers you want on Reader Service Card.

shafts, high-pressure self-sealing fasteners, power connectors, other products. *A.P.M. Corp.*

49—Coupling adapters. Here's an illustrated 12-pager (1255) with data on flexible flanged adapters. Drawings show how these products enable flanged meters, valves, regulators, etc., to be installed or removed easily. *Smith-Blair, Inc.*

50—Variable speed drives. Servospeed motor control systems, how they work and what they do, are explained in 16-page catalog. Details on subtractional, full-wave, integral hp., and other models. Diagrams. *Electro Devices, Inc.*

51—Couplings. New flexible couplings designed around special characteristics of non-metallic material are described in 12-page catalog. Advantages include compact size, light weight, zero backlash; no lubrication. *Lovell Mfg. Co.*

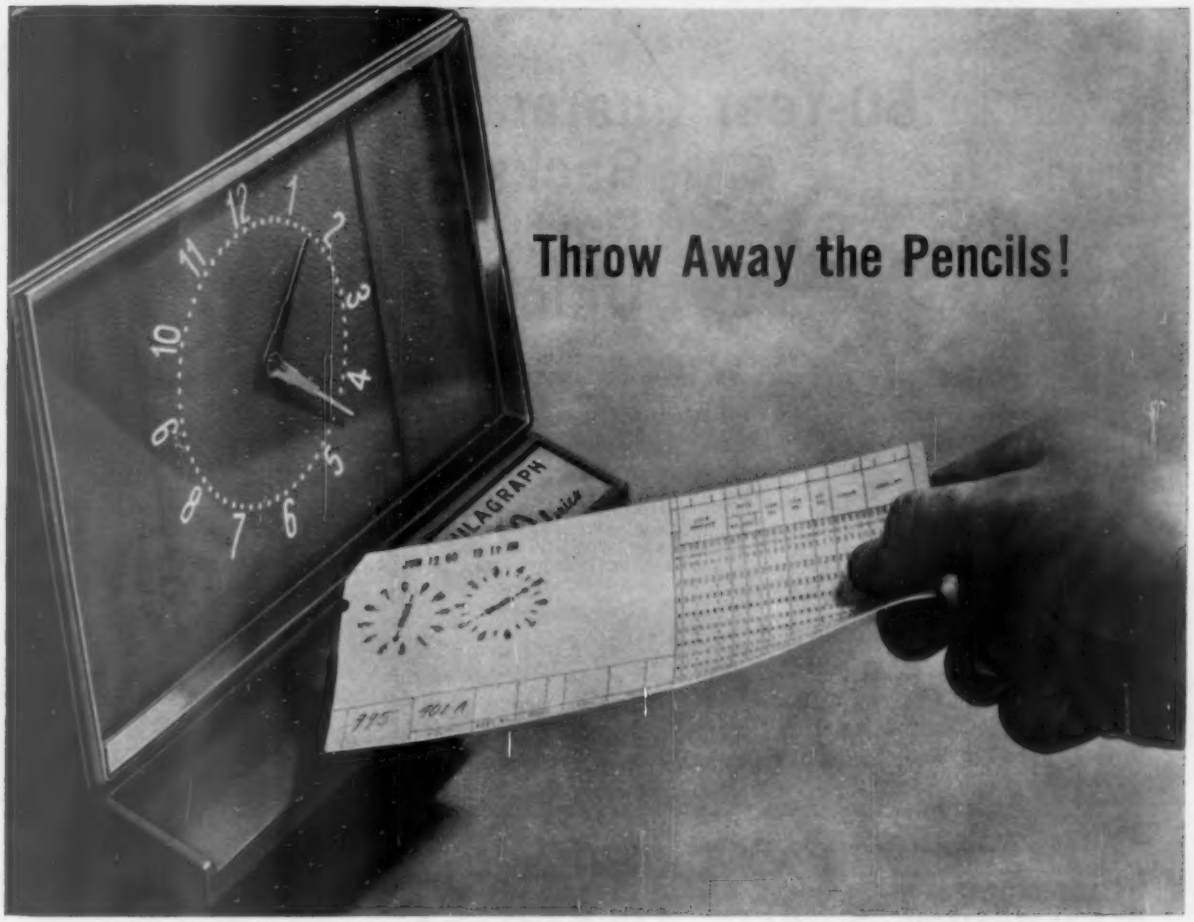
52—Air, hydraulic cylinders. Bulletin AJH-104S (32 pages) provides all the information you'll need to select cylinders by size, thrust, bore, stroke, mounting, etc. Includes torque table, photos. *Miller Fluid Power Div.*

PIPES, VALVES, AND FITTINGS

53—Control valves. This 16-pager (LB-4) gives details on construction and operation of single-seated, split-body LB valves. Includes specifications, valve sizing formulas. Shows optional actuators and accessories. *Conoflow Corp.*

54—Needle valves. Circular 568 (4 pages) describes space-saving valves for instrument lines, orifice meters, gauges, fine regulation of gases and liquids. Shows both sectional and exterior views, complete dimensions. *Lunkenheimer Co.*

Turn the page



Calculagraph 500 Series automatically computes actual labor time — eliminates error-ridden manual methods.

Your data collection system can be greatly simplified and attain greater accuracy with the new 500 Series Calculagraph because this completely new computing time recorder, based on the time-tested Calculagraph principle, computes as well as prints the actual time worked on any given production job. There are no complicated levers or buttons to set. The 500 Series makes the decisions. Production workers merely insert job cards at the "start" and "finish" of the job. The 500 Series does the rest. The actual time worked, with nonworking periods automatically deducted, is printed on the job card and ready for processing.

The 500 Series dovetails easily with any internal data processing system or outside service center. In smaller systems where the volume does not justify the use of machine accounting, this new computing time recorder can be a system in itself.

Investigate this new 500 Series now. Write or call for more details and, if possible, send us samples of your job cards for analysis.

INDUSTRIAL DIVISION

CALCULAGRAPH Company

273 Ridgedale Avenue, Hanover, New Jersey

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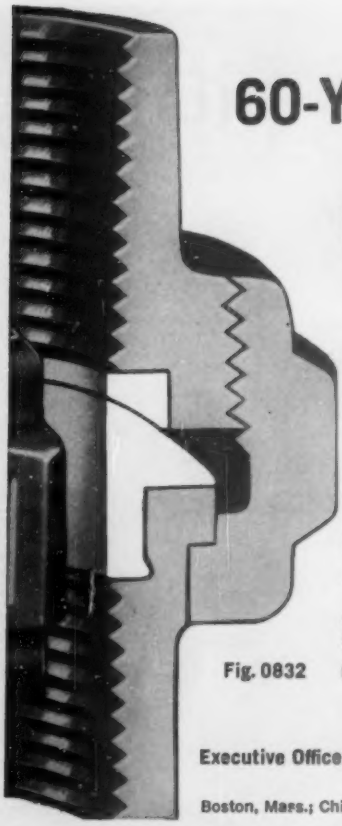

60-Year Guarantee Backs Dart Unions

For over 60 years every Dart Union has been backed by the firm GUARANTEE that "if one should leak through, we will give you two". Less than 1 in every 100,000 has proven faulty.

The extra wide bronze seats, ground on specially designed machines to a true ball and socket joint, are swaged under heavy pressure into air-refined malleable iron bodies. They come apart readily and remake repeatedly without excessive wrenching — without jamming. They are the reason that Darts may be used over and over again.

Sizes: ⅛" thru 4 inches
Pressure ratings: ⅛"-2"— 300 S.W.P., 600 W.O.G.
2½"-4"— 250 S.W.P., 600 W.O.G.
Darts also available in the all-iron construction.

Fig. 0832

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Boston, Mass.; Chicago, Ill.; New York, N.Y.; Pittsburgh, Pa.; Rome, Ga.

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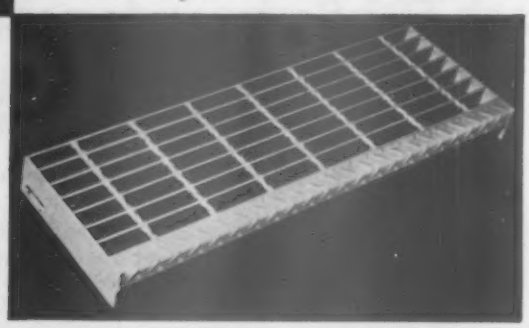
INSURE Safety Underfoot

with Strong, Light-Weight, Self-Cleaning



KERRIGAN Weldforged STAIR TREADS

Kerrigan's standard tread with Super-Diamond Nosing (illustrated) gives maximum visibility and underfoot safety where needed most.
Increase plant safety with these easily installed treads.
Send now for new, easy-to-use steel grating and tread catalogs.

KERRIGAN IRON WORKS COMPANY Nashville, Tennessee

• ADDRESS: Dep't. F-9

For more facts Circle 538 on Reader Service Card

Begins on page 212

CATALOG NEWS

For more data, circle item numbers you want on Reader Service Card

55—Safety heads. Bulletin 77-540 (6 pages) tells about the Quik-Sert head. It's small, compact; nests inside studs of standard ASA flanges; contains rupture disk to protect system from over-pressure. *Black, Sivalls & Bryson, Inc.*

56—Air valves. Three new four-way air control valves are presented in 4-pager (No. 0611-B1). Series HH models can fill and exhaust 100-cu.-in. load chamber from 0 to 90 psi. (100-psi. pressure) in 0.150 seconds. *Hannifin Co.*

57—Strainers. Descriptions and diagrams covering "Y" type and basket patterns are contained in 24-pager (No. 61). Lists semi-steel, cast, stainless steel, and bronze bodies; perforated sheet and wire mesh screens. *O. C. Keckley Co.*

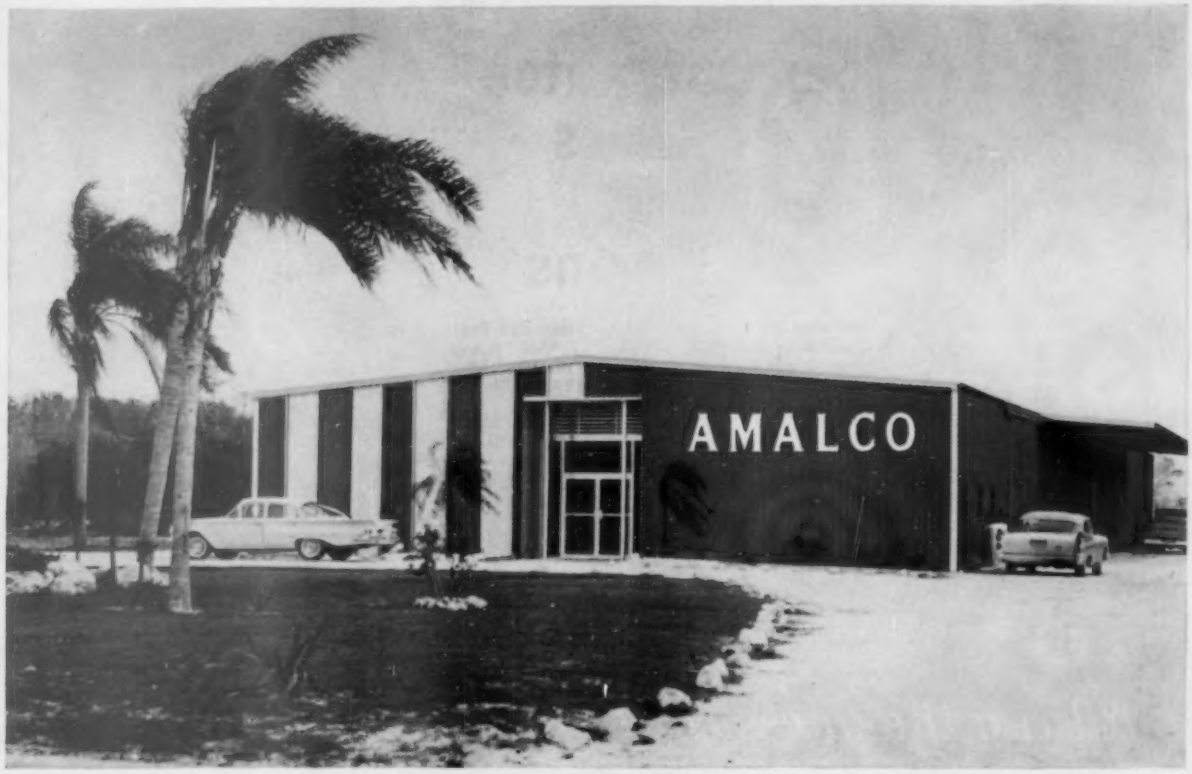
58—Plastic tubing. Electrical, thermal, and other characteristics of Flexite Shrinkdown insulating tubings are set forth in this 4-pager. Application examples. Photos. *L. Frank Markel & Sons.*

PLANT SITES

59—Pennsylvania. "This Is the Scranton Story" (30 pages) tells how a community changed from mining to manufacturing. Its two development plans attracted 50 new industries and 37 new plants. *Scranton Chamber of Commerce.*

60—Tennessee. Industrial sites of various sizes in Memphis and Shelby County are described in a folder of seven booklets. Quick-reference index tells how to find data on utilities, labor, taxes, and the like. *Memphis Light, Gas & Water Div.*

61—Michigan. "Livonia Proves that Local Initiative Works" is a survey that includes plans for plant sites built around transport, adaptability of manpower to local demands, and other factors. *Industrial Development Commission.*



STRAN-STEEL PUTS WORK SPACE IN A SHOWCASE

American Aluminum Company makes a product and meets its public in a single Stran-Steel building! Pre-engineered Stran-Steel gives a maximum of column-free space for fabricating operations, plus plenty of room for attractively panelled salesrooms. The building's modern low-pitched roof is a striking addition to the community, increases its customer appeal, too. And exterior panels—with a choice of 10 colorful Stran-Satin peelproof coatings—will stand up to tropical weathering for years. Easy to buy, dual purpose Stran-Steel buildings can be financed under your Stran-Steel contractor's low-cost "package deal" plan. Call him today—he's listed in the Yellow Pages under *STEEL BUILDINGS* or *BUILDINGS, STEEL.*

STRAN-STEEL
Buildings for Modern Business

American Aluminum Company of Bradenton, Florida, fabricates storm windows, doors and carports in a modern, attractive LR 60' x 194' Stran-Steel building, shown at top in Stran-Satin Blue.

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Please send complete literature on Stran-Steel Buildings in Stran-Satin Color. I'm interested in a building approximately_____ ft. by _____ ft. to be used for _____

Name _____ *Title* _____

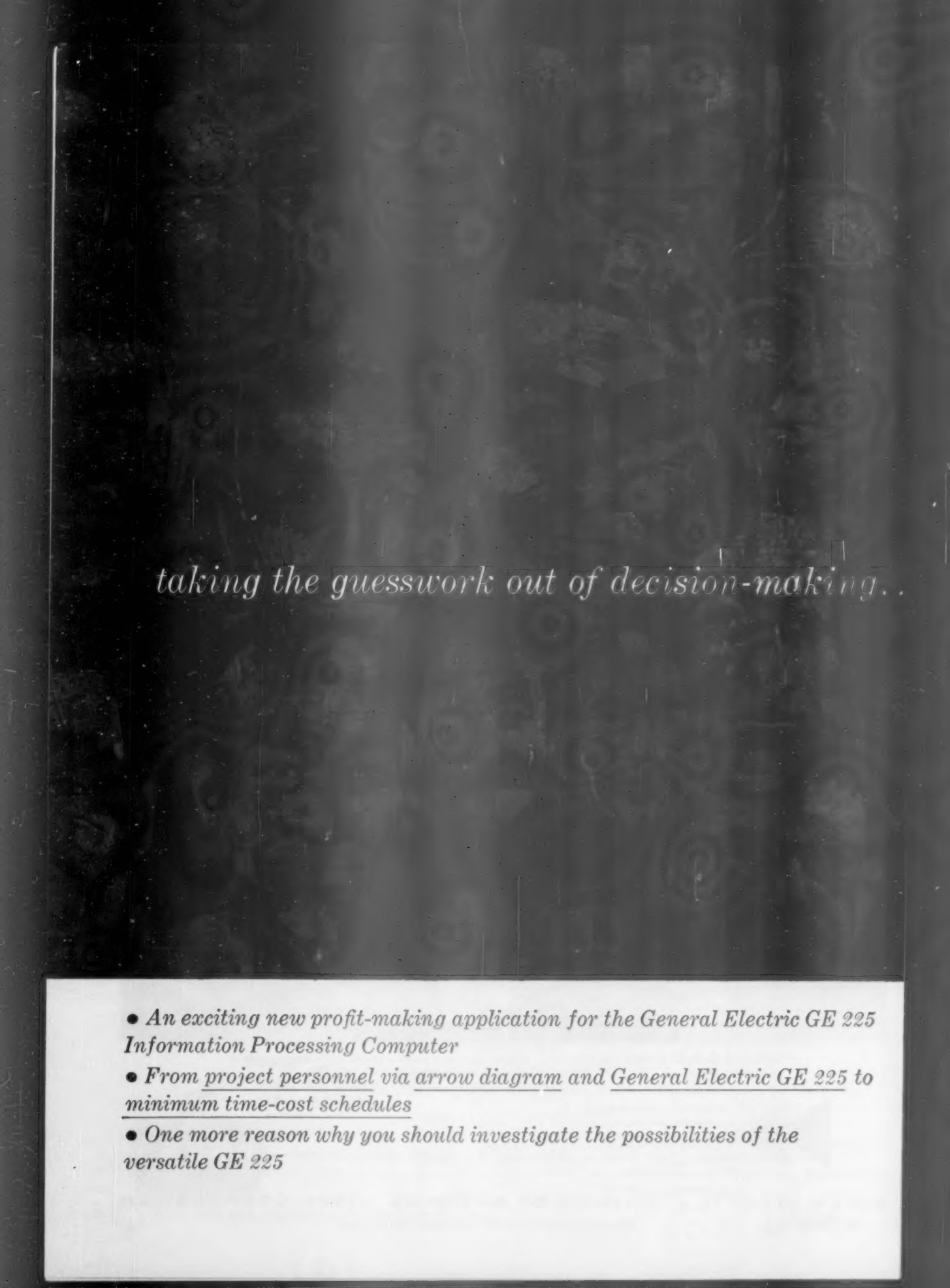
Company _____ *Phone* _____

Address _____ *County* _____

City _____ *Zone* _____ *State* _____

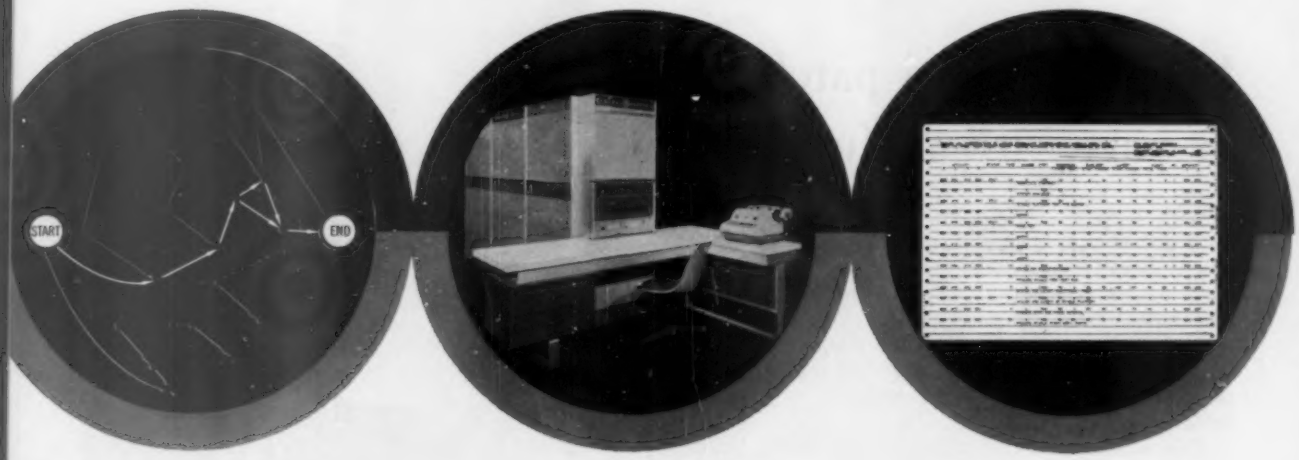
STRAN-STEEL IS A DIVISION OF **NATIONAL STEEL CORPORATION**

For more facts Circle 539 on Reader Service Card



- *An exciting new profit-making application for the General Electric GE 225 Information Processing Computer*
- *From project personnel via arrow diagram and General Electric GE 225 to minimum time-cost schedules*
- *One more reason why you should investigate the possibilities of the versatile GE 225*

ENGINEERING R & D • HIGHWAY CONSTRUCTION • BANK AUTOMATION • SLUM CLEARANCE • PLANT SHUT-DOWN • CONVERSION TO COMPUTER • NUCLEAR POWER PROJECTS • MISSILE PRODUCTION • REFINERY MAINTENANCE



PRECISE PROJECT PLANNING WITH THE GE 225 AND CPM

• To drastically reduce the need for managerial guesswork and to deliver precise data required for timely decision-making, General Electric *now* offers Critical Path Method (CPM) processing capability on the GE 225 computer.

• A new, advanced technique for project planning, scheduling and control, CPM can pinpoint your critical jobs to prevent bottlenecks before they result in costly and unnecessary delays.

• CPM is based on a pictorial project representation—an "Arrow Diagram" or "Project Network"—which shows the relationship and sequence of work to be done.* As employed by the GE 225, the Critical Path Method can be used for all types of project problems—from manufacturing, maintenance or construction planning to corporate planning, product launching and missile countdown.

• The CPM program developed specifically for the GE 225 efficiently processes *both* COST *and* TIME information on each job in the project to obtain *minimum* time-cost schedules. As a result, management and project personnel alike obtain pertinent and timely information on plans and schedules.

• The GE 225 CPM application is an advance providing for automatic event re-numbering and direct priority weighting of each project job in the most efficient manner.

• General Electric sales representatives, backed up by new General Electric Computer Department Information Processing Centers, can further explain this exciting and flexible use for a GE 225 and are ready NOW, working with your consultants and management, to integrate information handling equipment into your business.

• The application of the GE 225 to CPM represents one of many new advances pioneered by General Electric. It would be a wise move for you to investigate the benefits of the Critical Path Method, GECOM and other General Electric advances—all available for the GE 225. GECOM is the General Compiler which processes English language statements (COBOL), Algebraic expressions (ALGOL), Structured decision tables (TABSOL) and the File and Report Information Processing Generators (FRINGE).

For more information, write to General Electric Company, Computer Department, Section 65V9, Phoenix, Arizona, or contact your nearest General Electric Computer Department District Office listed below.

Atlanta: 270 Peachtree St. N.W., 522-1611 • **Boston:** 140 Federal St., HU 2-1800, Ext. 311 • **Chicago:** 120 S. La Salle St., 782-5061 • **Cleveland:** Williamson Bldg., 215 Euclid Ave., SU 1-6822 • **Dallas:** 3200 Maple Ave., RI 8-0589 • **Detroit:** 680 Antoinette St., TR 2-2600 • **Houston:** 4219 Richmond Ave., MO 7-3301 • **Kansas City, Mo.:** 106 W. 14th St., GR 1-2919 or GR 1-2920 • **Los Angeles:** 1010 S. Flower St., DU 1-3641 • **Louisville:** Bldg. 6, Appliance Pk., GL 4-7511 • **Minneapolis:** Plymouth Bldg., 6th & Hennepin, FE 2-7569 • **New York:** 122 E. 42nd St., PL 1-1311, Ext. 3205 • **Philadelphia:** 3 Penn Center Plaza, LO 8-1800 • **Phoenix:** Guaranty Bank Bldg., 3550 N. Central Ave., AM 4-3741-2 **Pittsburgh:** 1634 Oliver Bldg., Mellon Sq., AT 1-6400, Ext. 566 • **San Francisco:** The Russ Bldg., 235 Montgomery St., DO 2-3740 • **Schenectady:** Bldg. 2, 1 River Rd., FR 4-2211, Ext. 5-4405 • **Seattle:** Dexter Horton Bldg., 710 Second Ave., MA 4-8300 • **St. Louis:** Paul Brown Bldg., 818 Olive St., GE 6-4343 • **Syracuse:** 1010 James St., GR 6-4411, Ext. 6141 or 6142 • **Washington, D.C. Area:** 7401 Wisconsin Ave., Suite 514, Bethesda, Md., OL 2-8100 • **In Canada:** Canadian General Electric Co., Ltd., Electronic Equipment and Tube Dept., 830 Lansdowne Ave., Toronto, Ontario, Canada. **Outside U.S.A. and Canada:** Producer Goods Export Department, International General Electric Company Division, 150 East 42nd Street, New York City, New York, U.S.A.

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*THIS METHOD WAS DEVELOPED BY MAUCHLY ASSOCIATES, AMBLER, PENNSYLVANIA—TORONTO, CANADA.

For more facts Circle 540 on Reader Service Card

GPM-65 (6-63)

MATERIALS NEWS

For more data, circle item numbers on Reader Service Card next to back cover.

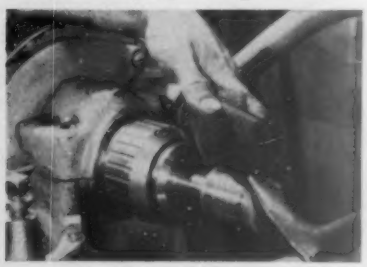
Mold your own patch or part without fuss

Devcon R is a new family of rubber-like materials (not an epoxy). It will do many jobs at savings in time, money, and labor. It can be used to repair conveyor belting, hose, or other rubber products, as well as line chutes, tanks, and pumps where abrasion resistance is needed. The material can act as a vibration dampener or a machinery mount. It can be cast into rubber replacement parts without heat, pressure, or expensive molds.

This versatile material comes in two forms. Devcon R-A is a putty-like substance that can be troweled 1 inch thick on a vertical surface without running; Devcon R-B is a liquid type that can be poured and cast up to 4 inches thick (photo).

Both mixtures cure, without shrinking, at room temperature in 24 hours, but heat will accelerate the job for the impatient. Both have high tensile strength, high tear and abrasion resistance, and good adhesion to iron, steel, aluminum, wood, rubber, canvas, glass, and some plastics. Once cured, the mixtures are resilient even at low temperatures, have little tendency to cold-flow under pressure. They are also oil- and chemical-resistant. *Devcon Corp.* (Circle 195)

Cleaning pad polishes, removes defects



Quick, easy removal of rust, burrs, and scratches from all types of metal in hand operations is possible with new Scotch-Brite pads. The nylon-web pads are impregnated with abrasive particles. They will not shred, rust, conduct electricity, or cut hands. Can be rinsed easily for re-use. *Minnesota Mining & Mfg. Co.* (Circle 196)

Epoxy compounds aid high-speed molding

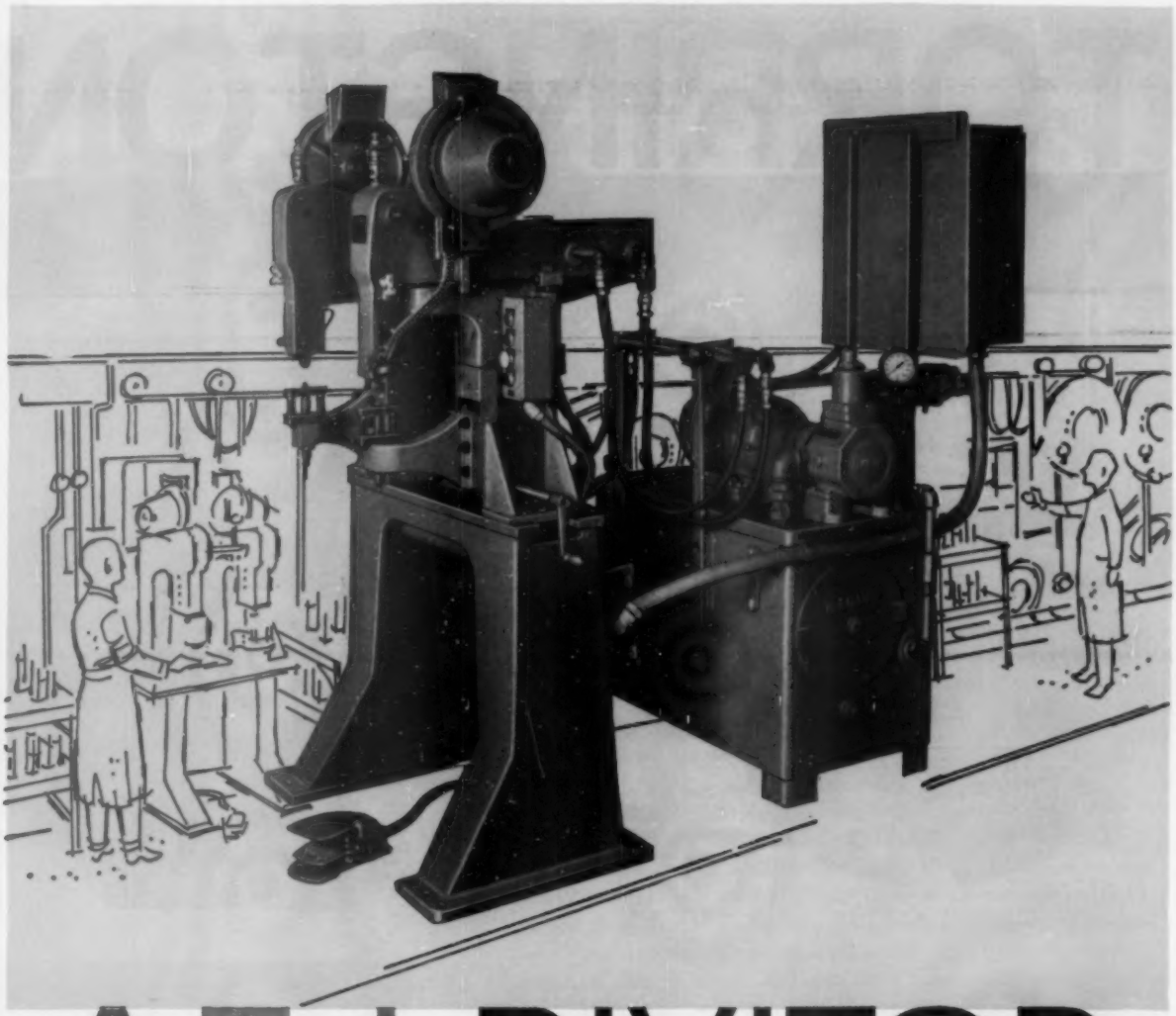
Designed for high-speed molding production, the EMC 90 series compounds feature high flow at low temperatures and pressures with 15-second curing and excellent mold release. Molding properties are unaffected after one year's storage. Ideal for component encapsulation and structural uses. *American-Marietta Co.* (Circle 197)

198—Soil solidifier is a single-shot low-cost chemical grout. The product-system wets soil grains and displaces ground water from soil masses. It forms an effective barrier against water penetration both below and above the ground water table. *Diamond Alkali Co.*

199—Dry lubricant has been formulated to overcome sliding friction problems on heavy machinery. Dri-Slick is applied with brush. It can withstand temperatures from −65 to +800 F. Cannot be squeezed out, will not attract dirt or wash off. *G. W. Smith & Sons, Inc.*

200—Instant-grab adhesive speeds carton sealing. Pressure-sensitive tape is reinforced with glass filament to give it tensile strength of 325 lb./in. Makes it ideal for strapping metal, wood, glass, and plastic items. *Permacel.*

Turn the page



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on your production line means higher production rate . . . lower unit cost!

T-J Rivitors and Clinchors are designed, engineered and manufactured to conform and operate efficiently on today's high-speed production lines. For whatever your product . . . if it demands a fastening assembly procedure . . . a T-J riveting or clinching machine adds to its high quality standards by their ability in providing long, rugged service-free life.

Many standard designs to choose from . . . or a T-J can be custom designed for your exact requirements. Write Tomkins-Johnson, 2425 W. Michigan Ave., Jackson, Mich., today. Ask for Rivitor and Clinchor Bulletin No. 646 or Clinchor Bulletin No. 555.

RIVITORS

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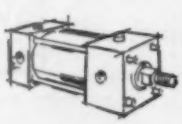

CYLINDERS

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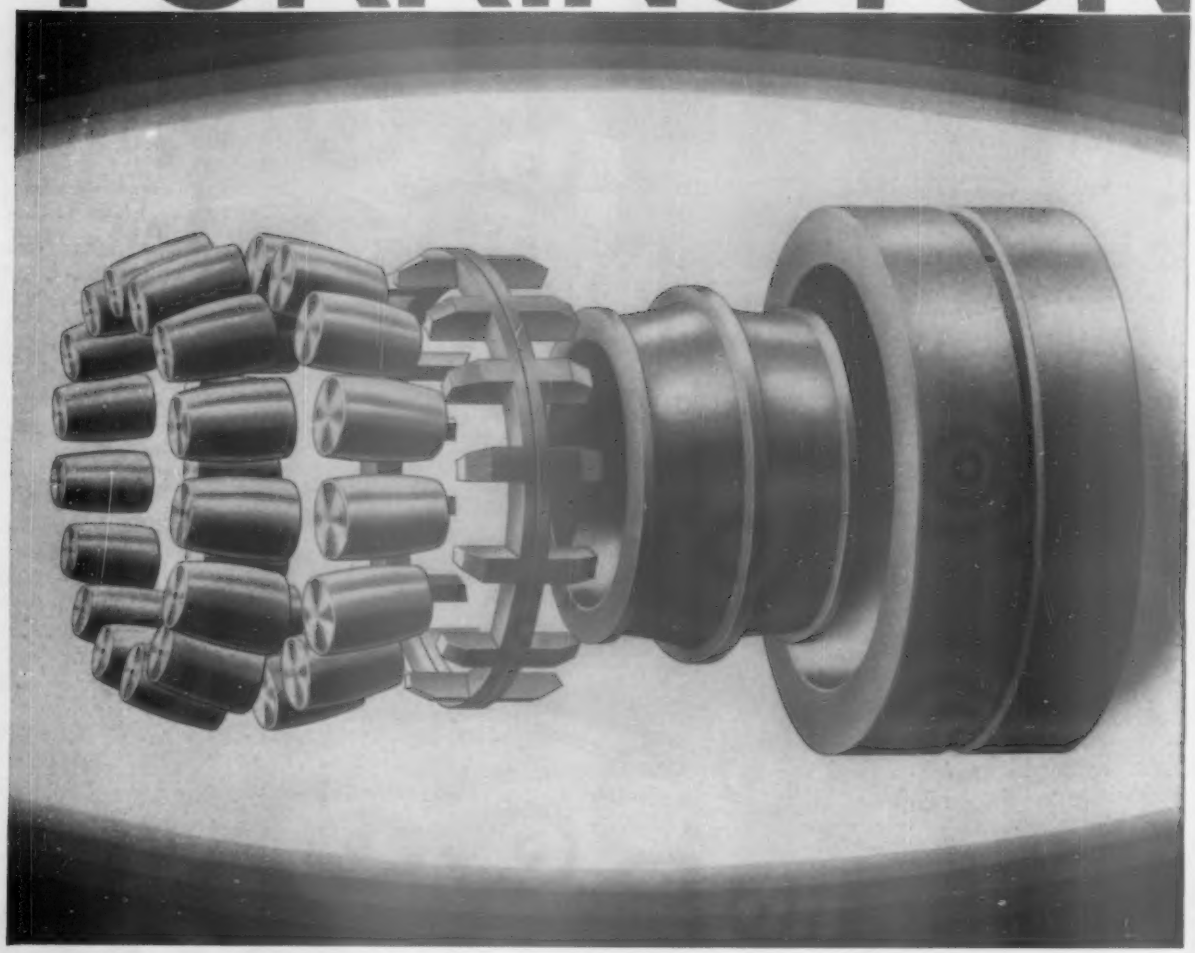

FOR THE INSIDE STORY...

...ON TORRINGTON SPHERICAL ROLLER BEARINGS, one word: *precision.* Each individual part is precision-engineered to the highest standards in the industry...functions precisely and efficiently with all other parts.

Every roller is matched electronically within .0001" for even-load distribution and maximum capacity.

Each independent land-riding cage spaces rollers precisely...prevents roller drag even under the heaviest loads and possible misalignment.

The integral guide flange is ground to a common spherical radius with the roller ends for positive roller guidance, greater stability.

For minimum friction and wear, both inner and outer races are precision ground to conform exactly to roller contours.

Put together...a Torrington Spherical Roller Bearing for superior performance, reliability and long service life. Buy the best...specify Torrington.

SUPERIOR PERFORMANCE FEATURES OF TORRINGTON SPHERICAL ROLLER BEARINGS

- ☐ inherent self-alignment
- ☐ conformity of rollers to raceways
- ☐ integral center guide flange for stability
- ☐ positive roller guidance
- ☐ land-riding bronze cages
- ☐ maximum radial and thrust capacity
- ☐ controlled internal clearance
- ☐ electronically selected rollers
- ☐ even load distribution
- ☐ long, dependable service life

progress through precision **TORRINGTON BEARINGS**

THE TORRINGTON COMPANY South Bend 21, Indiana • Torrington, Connecticut

For more facts Circle 542 on Reader Service Card

FACTORY

Begins on page 230

MATERIALS NEWS

For more data, circle item numbers you want on Reader Service Card.

201—Cryogenic metal seal provides leakproof sealing through high and low extremes of pressure. The seal requires lower bolt and flange loads than those necessary for gaskets and for most other types of seals. *Rocketdyne Div., North American Aviation, Inc.*

202—Compact heating element is for spot heating applications. Unit provides temperatures over 300 C., with glass sizes 1- to 27⅜-in. sq., and 3/32- to ¼-in. thick. The glass panel, coated with metallic film, forms electrically conductive path. *Corning Glass Works.*

203—Rust remover acts by chemical action to remove rust to bare metal. Aci-Gel, suspended in a thixotropic gelling agent, brushes on and clings to vertical surfaces. Easily flushed off with water to leave a clean surface for painting. *Sloan Chemicals, Inc.*

204—Silicone rubber insulation is now available with multi-color stripes that will not rub off. This coding permits the use of smaller wires in multi-conductor cables and results in lighter, extra flexible, reduced-diameter cable. *Boston Insulated Wire & Cable Co.*

205—Fire-retardant Hetrofoam 250 is a general-purpose rigid polyurethane foam that has good heat stability, low "K" factor, low water absorption and moisture permeability, and excellent dimensional stability. Contains chlorine-rich Het Acid. *Hooker Chemical Corp.*

Turn the page

No. 10 In a series of washroom survey comments from "SBS soap counselors"

We showed them how "on-the-job" cleansing licks tough soil problems.

John Walsh

veteran SBS soap counselor, specializes in industrial soil removal. Here's his report after surveying a large paint manufacturing plant.

"Workers in certain departments of this plant are in constant contact with soils that are hard to remove or irritating to the skin . . . for instance, paints, resins, thinners, pigments, and caustic soda. Management issued some protective clothing, but this measure still left face, hands and arms unprotected. Dermititis was on the increase. What to do?

"We recommended 'bringing the washroom to the worker' by installing *SBS 30 Waterless Washstations* in all of the sensitive areas. We knew from our survey that *SBS 30* will remove all of these problem soils — quickly, safely and at very low cost per clean-up."

Money-saving suggestions like this *begin* with OPERATION PINPOINT–a thought-provoking presentation filled with facts about skin hygiene and washroom maintenance. The SBS soap counselor serving your area can pinpoint the right soap to do every skin cleansing job best and at lowest cost in your plant. Let him show you OPERATION PINPOINT . . . just call your nearest SBS office, collect.

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TOUGH!
4 times stronger, 2-6 times more abrasion-resistant than heavy duty concrete. Denser than any known chemical-resistant floor surfacing material.

DO-IT-YOURSELF!
Regular personnel simply mix and apply ¼" covering. No special tools or equipment needed, no re-levelling installations.

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Trowels rough or smooth depending on requirements. Takes light to medium traffic in 10-15 hours, heaviest traffic in 72.

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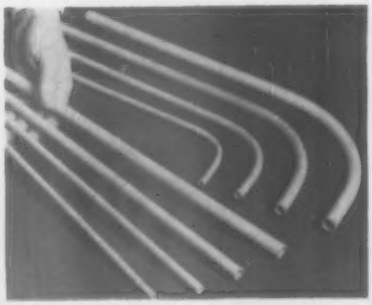
City_____ Zone____ State_____

Begins on page 230

MATERIALS NEWS

For more data, circle item numbers you want on Reader Service Card.

206—Common ferrous metals can be up-graded using a low-temperature molten salt bath, which increases resistance to wear, surface durability and fatigue strength rather than increasing hardness. This Tufftriding process completes change in minutes. *Kolene Corp.*



207—Postformable tubing, Micarta type, in two new grades has enough thermoplasticity to soften and bend when heated for five minutes at 135 to 150 C. Features high compressive and dielectric strength and chemical resistance. *Westinghouse Electric Corp.*

208—Film adhesive, high-strength thermosetting (AF-110), cures at pressures of 10 to 25 psi. For metal-to-metal bonding and metal honeycomb sandwich design. Needs no jigs for pressure application. Shear strength over 4000 psi. at 180 F. *Minnesota Mining & Mfg. Co.*

209—Flat wire belting comes in widths up to 12 feet in 1, 2, and 4 mesh sizes, and is made of carbon, galvanized, or stainless steels. Standard wire widths of ⅜-in. diameter can be varied to needs. *The Cambridge Wire Cloth Co.*

210—Fluorescent sealant for locking studs and bolts in place permits inspection and identification by means of ultra-violet light. Addition of dye doesn't affect shelf life. Loctite provides greater locking torques than mechanical devices. *American Sealants Co.*

Turn the page

No area can be all things to *all* industries. But we've got down-to-earth facts that prove the Toledo-Northwestern Ohio area is right for these specific industries:

PAPER AND PLASTICS PRODUCTS
BUILDING AND STONE PRODUCTS
FOOD PROCESSING • CHEMICAL PROCESS
MACHINERY PRODUCTION
PRIMARY METALS • ELECTRONICS

These facts are reported in a study of the area by Fantus Research, Inc., one of the nation's foremost industrial location services. For more information, write R. E. Johnson, Manager, Industrial Development Department, The Toledo Edison Company, Toledo 1, Ohio.

THE TOLEDO EDISON COMPANY
an investor-owned electric light and power company serving Northwestern Ohio

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THINGS
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a diversified, growing company
meshed to the needs of modern
industry . . . supplying engineered
components, equipment and services
for construction, processing and
product finishing. Mahon is
unique . . . and provides unique
one-source benefits.
Mahon means varied Building Products—
engineered for today's industrial construction
Mahon means all types of structural
steel fabrication and erection
Mahon means Process Equipment
—designed, built and installed
Mahon means the best in finishing—
from spray booths to complete systems
Mahon means Steel-Weld fabrication—
with a faculty and facilities for tough jobs

The present scope of Mahon has been developed on a multiple-activity base with a singleness of purpose—*a business to serve your business.* Whether you're building a new plant, designing a heavy-construction project, modernizing facilities, evaluating new finishing methods, looking for improved process techniques or the right steel-fabricating source—Mahon offers an industrial 'package' that contributes to your growth, profit and progress. Investigate the products, services, resources, capabilities *and advantages* of Mahon.

MAHON

THE R. C. MAHON COMPANY DETROIT 34, MICHIGAN

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Why you should think of your scales as MONEY WEIGHING MACHINES

Cold, hard cash is the final value yardstick you must apply to every material or product that moves into, through, or out of your plant. How much does it cost? How much does it save? How much profit does it produce? In the last analysis, the answer always comes up in dollars and cents.

With dollars at stake, the *right* Toledo Scale at each weighing point is of the *utmost importance* . . . the backbone of control your needs demand. Your Toledo representative will take a personal interest in helping you get all the benefits provided by advanced Toledo methods and equipment. Write today. Toledo Scale, Division of Toledo Scale Corporation, Toledo 12, Ohio. *(Toledo Scale Company of Canada, Ltd., Windsor, Ontario.)*

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Prints where you wish on full 8½" x 11" forms, or on tickets or strips. Prints full figures, even when unit weights are used. Positive weight identification, with selective numbering, weight symbols, or consecutive numbering. Also prints time and date, if required. Weight data may be transmitted electrically to remote adding or other office machines. Ask for Bulletin 2017.

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TOLEDO®

Headquarters for Weighing Systems

Begins on page 230

MATERIALS NEWS

For more data, circle item numbers you want on Reader Service Card.

MATERIALS LITERATURE

211—Gasket materials are described in this 24-page brochure (AD-190). Included are gasketing materials such as Viton, silicone, neoprene, and Teflon. Details materials' resistance ratings for 120 fluids and gases. *Garlock Inc.*

212—Structural tubing made of hot-rolled carbon steel in square and rectangular forms is the subject of this 6-pager. Gives specifications, tables of grades and properties, methods of testing. *National Tube Div., U. S. Steel Co.*

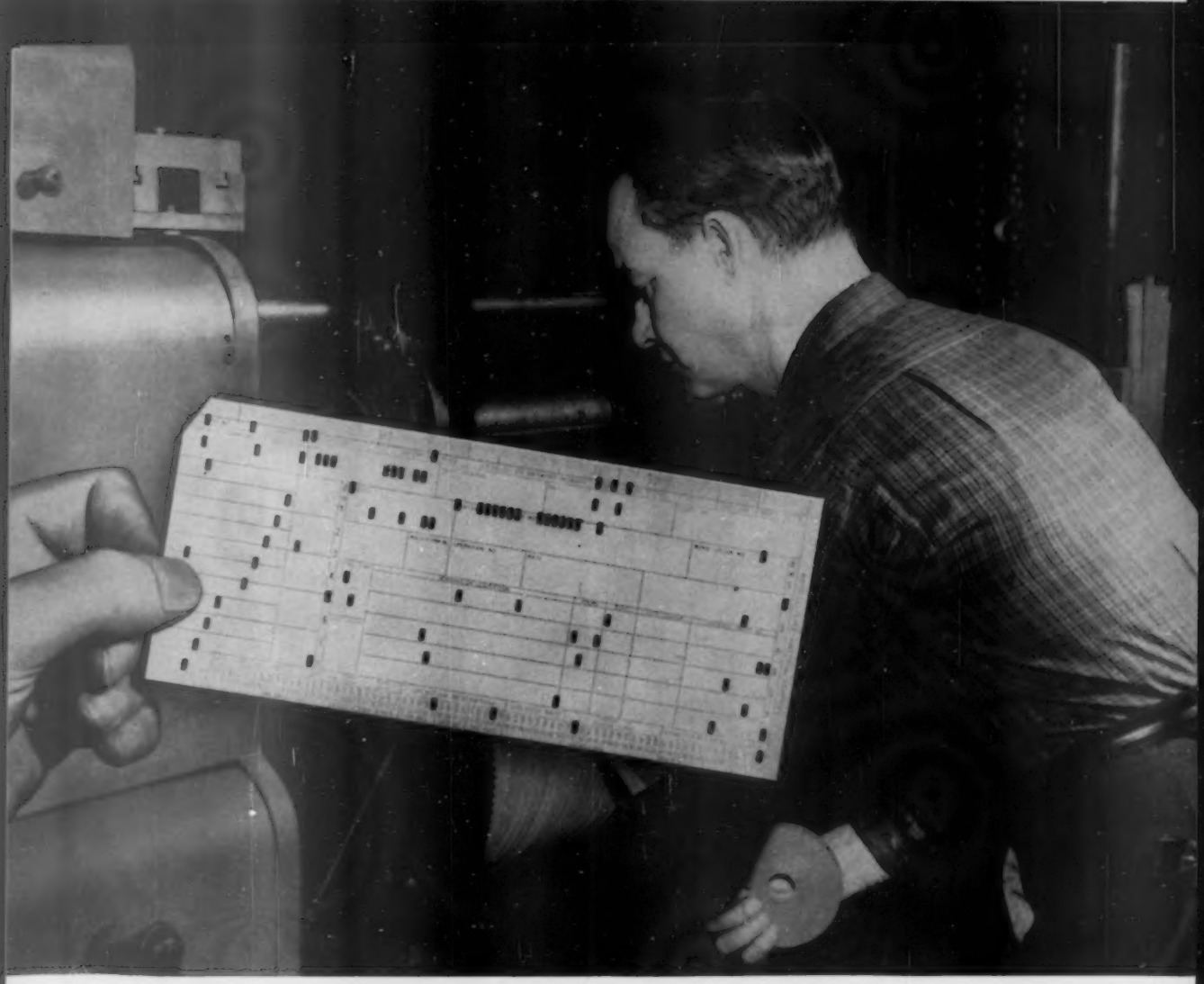
213—Packaging qualities of urethane are examined in 20-page illustrated booklet, "Urethane Foam Protection: A Fact File for the Industrial and Commercial Packager." Includes applications, factor-stress curves. *Mobay Chemical Co.*

214—Flat lenses made of light plastic disks are presented in this 8-page brochure (6104-10T). Illustrates solutions of optical problems with Frenelenses often found impossible with conventional glass lenses. *Stocker & Yale, Inc.*

215—Epoxy coatings to protect motor stator windings against moisture, dirt, abrasion, impact, and chemicals are described in two 4-page bulletins (MR-1 and MR-2). Give application details and curing methods. *Hysol Corp.*

216—Corrosion-proof cements, flooring materials, interliners, coatings, and rigid plastic fabrications are covered in this 16-pager. Data on properties; application photos. *Atlas Mineral Products Co.*

217—Noise control techniques for maximum quieting with Fiberglas are outlined in 14-page booklet. Has performance tables, nomographs, curves, drawings, and photos. *Owens-Corning Fiberglas Corp.*



LINE MATERIAL INDUSTRIES McGRAW-EDISON COMPANY USES

IBM 357 Data Collection System for high-speed intra-plant data transmission

As each shift ends, management at Line Material Industries has an accurate, up-to-the-minute record of production.

The 357 gives the foreman a detailed audit of all jobs and worker efficiencies current as of their preceding shift.

The employees like the system because it records their production accurately and quickly, and is simple to use.

Each employee inserts his identification card in the 357 station nearest his job location...enters the work codes and number of production pieces on the simple keyboard. Instantly the 357 transmits this information to the data processing center where it joins information coming in from other employees.

In addition, the 357 records time and attendance for all employees and handles all maintenance reporting.

You too can benefit from an IBM TELE-PROCESSING* system.

IBM TELE-PROCESSING systems make the data you need to conduct your business, available where and when you want it. They link any number of information sources with centralized control. They make possible faster decisions. They report those decisions instantly, to be acted upon with minimum delay. Here is a modern management tool that shrinks time and distance...to speed management response to what's happening elsewhere.

Fifteen IBM 357 input stations and two central output control units handle all reporting and recording of employees' production at Line Material Industries.

IBM®
DATA PROCESSING

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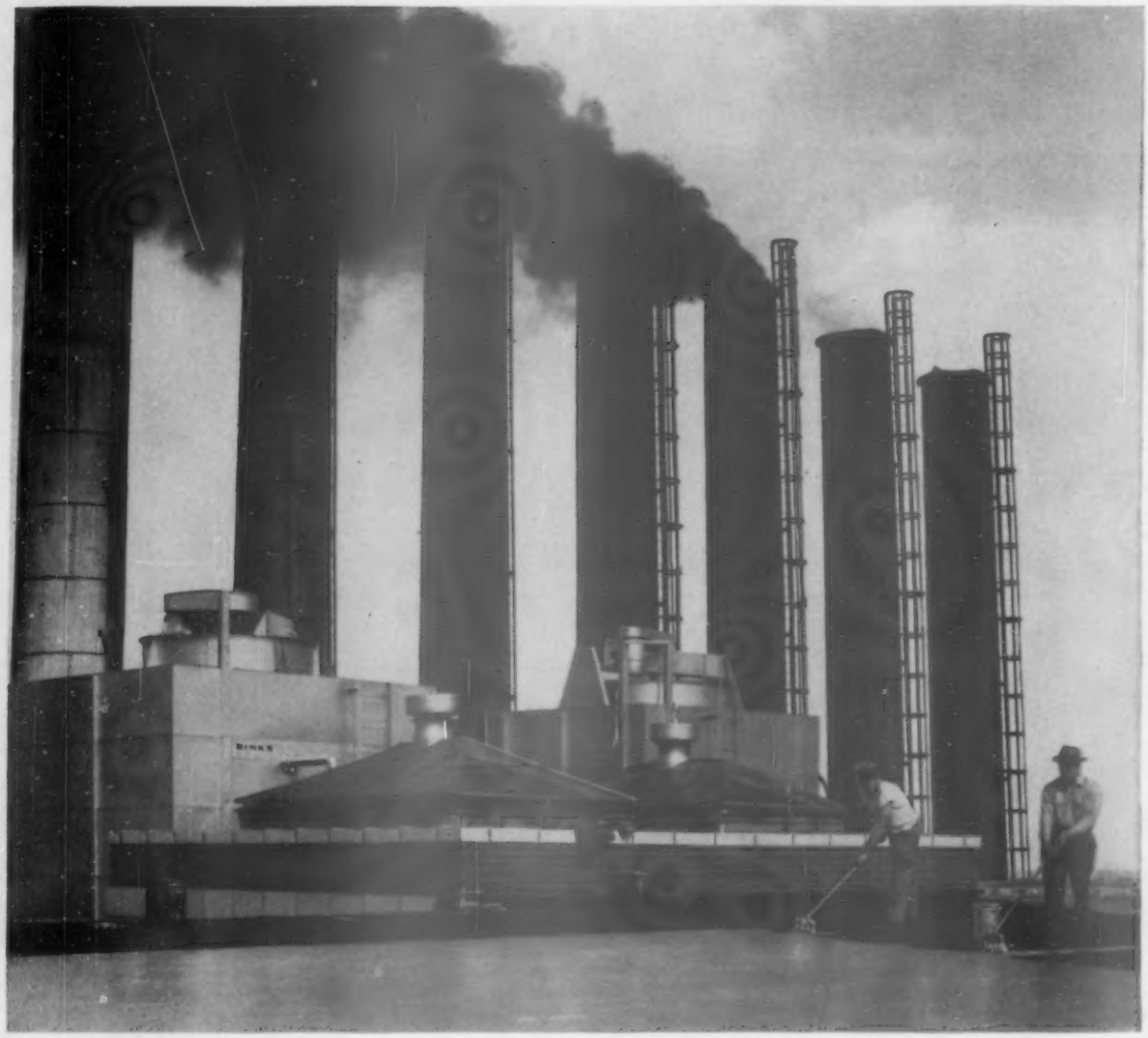
For more facts Circle 548 on Reader Service Card



resists corrosion attack

Aluminum paint protects metals from corrosive fumes, smoke and gases

The Finest Paints Made with Aluminum are made with REYNOLDS ALUMINUM PIGMENT

The thin, solid coat of aluminum that forms on surfaces painted with aluminum provides a lasting protective shield against rust and corrosion. Weathering exceptionally well, paint made with Reynolds Aluminum Pigment offers the major benefits of solid aluminum in liquid form. It's easy to apply, economical to use—and adds years of service life to the structures it covers. *Reynolds Metals Company, P.O. Box 2346-PL, Richmond 18, Va.*

REYNOLDS ALUMINUM

Watch Reynolds TV show "Harrigan & Son", Fridays—ABC-TV

For more facts Circle 549 on Reader Service Card **Circle 550 on Reader Service Card for items on next page**

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Bold attack on industry's sacred cows tells...

WHAT'S WRONG WITH SAFETY MANAGEMENT?

By LAWRENCE F. MIHLON
Associate Editor, FACTORY

MR. J. DAVIS
SAFETY MANAGER

Davis has spent over 17 years in plant safety and related personnel work. At one big company he was general safety supervisor and manager of safety services. And he was director of work simplification at still another major company.

So caustic are the remarks of the two men interviewed in this story that they requested that their real names not be revealed. We call them Mr. Davis and Mr. Miller. Whatever their names, their message is powerful *and painfully accurate.*

MR. K. MILLER
COMPANY PRESIDENT

During his 28 years in American industry, Miller has been engineer, plant manager, and corporate manager of safety. He now directs the fortunes and determines the policies—safety *and* manufacturing—of a major eastern firm.

Because of their naive adherence to yesterday's safety philosophies, U. S. plant men today pay the terrible price of over *$2-billion* a year lost in production and in medical and insurance costs.

But this figure could be cut in half, insist two of the country's top safety men, if the same management principles that are applied to production operations were applied to safety.

To effect this about-face, however, would demand a determined attack on some of the cherished techniques behind which most plant men seek refuge from responsibility.

Says Safety Manager J. Davis (above): "The responsibility for making safety work must rest with first-line supervision. Safety men must learn to live as staff specialists, nothing else."

Right now this stand is not universally popular. Davis admits there is resistance, especially from safety men who see it as a threat to their jobs. Is it a threat?

"Of course," answers Davis, "because the management approach needs fewer, better safety men."

But he's not alone in the fight. His long-time safety colleague, K. Miller (above), now president of his company, is equally outspoken: **"The safety function has too often become a hiding place for 'klucks'—men who are neither managers nor experts. This shouldn't be."**

What's behind this ice-cold, realistic approach to safety? How does it work? Does it pay off?

To get the answers we met recently with the two men. Before hearing the details of their approach, we asked for evidence of its effectiveness. Here it is:

When Miller joined his company, the previous year's record showed 35 accidents had lost 634 days' work. The frequency rate stood at 37.3 disabling injuries per million man-hours; severity was 847 actual days lost due to disabling injuries per million man-hours. Two years later two accidents lost 82 days. The frequency rate was 4.3. The severity mark was 175.

In 1960 and in the first few months of this year, the Miller safety program has recorded no days lost. Frequency and severity readings are non-existent.

Pointing up the side effects of a good safety program, the results of Miller's plan on labor turnover and absenteeism costs amounted to savings of over $140,000 last year. As he points out, this is considerable when figured against a total employment of only 250 and gross sales of $6-million.

PLANT MANAGERS MUST MOTIVATE

The two years Davis has spent in a much larger company are as impressive as Miller's. When he joined his firm in 1959, Davis reports he had some doubts that the safety record could be improved.

"Working conditions were excellent and the company had recognized the need for making (line) managers responsible for safety," he said.

But after Davis took over the plan came into even sharper focus. Since 1959 doctor cases have dropped 14%; total injuries are down 10%; compensation cases are down 17%; and compensation costs have dropped more than 60%.

The key to this management approach to safety is the first-line supervisor, the foreman. The spirit behind the plan, the motivator, is the plant manager.

As with any other well-managed plant function, staff men (in this case the safety specialists) search, appraise, and advise. The line men execute the plan. Responsibility is recorded through such standard devices as a monthly accident report for each foreman.

According to Miller, when there is a job well done, "it's the manager who should get a letter of recognition, not the employees."

AWARDS AND COMMITTEES? NEVER

But what about award programs? Don't they stimulate safety awareness? Davis and Miller answered almost in chorus:

"They're absolutely worthless. Not even worth the cost of the metal they're made of. They've become no more than gimmicks set up to avoid establishing responsibility."

Certainly, the two men conceded, recognition is needed. But it should go to the plant manager and the foreman who are responsible for a safety program's success. They suggested a personal letter from the company's chief executive to the key men in the program.

What about the safety committee, one of industry's pet devices?

"Safety committees are for the birds," the two answered in perfect agreement.

Miller said the committee defeats the primary purpose of the management approach. It places responsibility for the safety program in the hands of a random group. The group dilutes its own influence.

"How can an employee group be expected to enforce a safety program when (1) it has no management power and (2) it meets only periodically?" he asked.

Miller explained that since safety committees rarely have spending authority, any safety purchase they recommend usually gets nowhere.

Most committees think they have the responsibility for safety, but in reality do not, he pointed out. He quickly cautioned that neither he nor Davis advocate the abolition of the committee as a teaching organ. "But if that's the purpose, why not call it a class or study group?" he asked.

The suggestion to kill the safety committee usually stirs the most controversy among tradition-bound plant men, the two managers admitted. Nonetheless, both men urge the demise of the committee wherever they're asked to speak.

To counter objections, they challenge an opponent to read the minutes of his plant safety committee. If there are no minutes, the argument against the group is proved immediately. It takes a few minutes longer if minutes do turn up. Miller tells why.

"In the minutes it's usually discovered that the group is only concerned with superficial solutions to generally trivial problems. If anything, the minutes turn out to be simply a recital of housekeeping inspections. If responsibility were properly assigned in the first place, the housekeeping report would not have been necessary."

REALISTIC GOALS ARE VITAL

Recently at an awards dinner Davis was asked to present his views on safety. He was scheduled to go on after an award presentation to the plant safety manager. The manager extended credit to his safety committee on receipt of the award.

Davis came on with both barrels blazing. Naturally he urged "down with the safety committee." His argument was the one you have just read above.

After the dinner was over, the award-winning safety manager approached Davis and said: "I've just disbanded our safety committee. Where do we go from here?"

Once committees and other escape mechanisms are dispensed with, responsibility for the safety program should be placed squarely on the plant manager and his foremen. "And here's where the safety expert comes in—as a staff specialist," Miller said.

At Davis' company, a president's letter on safety to all managers and a manager's manual on safety is circulated before the reins are turned over completely. The letter provides the vital impetus from the top. The manual presents company policy and procedure.

President Miller personally carries the safety message in his organization. Realistic, attainable safety goals are set up for each foreman.

Neither company has a safety committee or an award program.

The two safety men agree that, with the management approach, a full-time safety specialist is needed only in plants that have 1000 employees or more.

Turn the page

"Get rid of that DUST!"

"The boss was sore and I was on the spot.

"He shoved the report from the efficiency engineer at me. I read it: 'Yearly loss due to machine wear, misalignment and down time . . . $3,000. Major cause . . . abrasive dust.'

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SAFETY MANAGEMENT

Begins on page 240

What is the safety man supposed to do? At a recent meeting Davis defined the job: "Safety personnel perform a service function. They must fully understand their role as teachers, advisors, and appraisers. They do not need the power to direct or command to do an effective job. With their facts well marshaled, they must justify their existence through consultative skills and persuasive abilities."

Simply stated, this means that a safety man enters the line area only when he's asked.

THEY SHOULD STOP HIDING

Davis intimated that the safety man who must scurry behind his status when faced with this new approach is unsure of his competence:

"The safety man's job should be to develop and promote the arts and sciences of safety. **For example, in his unrealistic concern for status and line power, he fails to give adequate consideration to the human elements in engineering and design. Thus, he's still trapping people into having accidents."**

Reiterating his comment about the safety function being a hiding place for "klucks," Miller said that, ideally, a safety job should not be looked upon as a permanent spot. "A safety position should be only a training ground, a stepping stone to a higher management position." He insisted it could be thus if the safety function were maintained as a staff spot; a spot that allows its man to go where he pleases in the company to look and appraise.

"Industry doesn't need more safety men, it needs better safety men," Davis said. He explained this means personnel managers must become considerably more sophisticated in their screening techniques. They should look, he said, for young men with engineering backgrounds. But they should be men who can teach and persuade; men who possess considerable personal courage.

"Once you have this man, and have clearly set your management responsibility, you're program is ready to go," Davis said.

Turn the page

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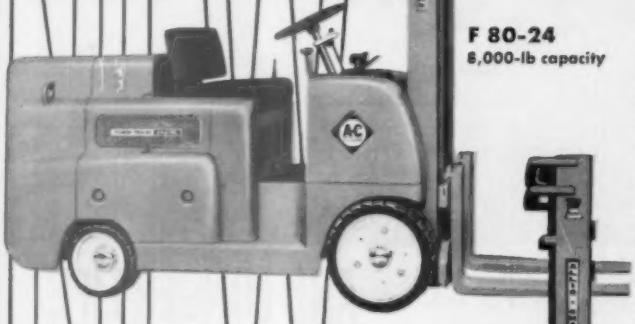

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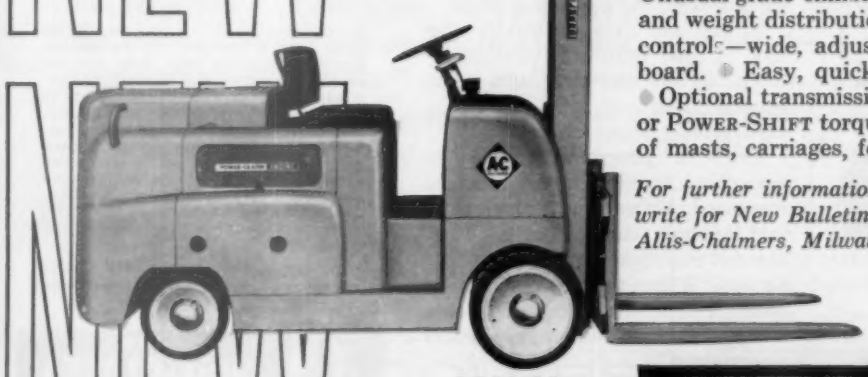

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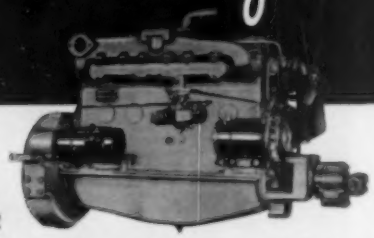

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Begins on page 240

How do you enforce such a program? With the same discipline you'd use for any plant operation.

The two men explained that once goals are established, each foreman is expected to meet them. Safety rules set up are expected to be adhered to.

Anticipating a question, Miller said: "I'd fire any man guilty of breaking these rules, or any foreman refusing to enforce the rules."

Some managers feel that an injury itself is punishment enough for breaking a safety rule. Both our safety men disagree strongly. They feel that unless disciplinary action is taken immediately, the rule itself becomes a worthless sham.

YOU'VE GOT TO BE TOUGH

A recent case in Davis' company points up this matter of discipline.

After exhaustive research, safety men concluded that wearing finger rings constituted a hazard in areas where electronic gear was being made. Covering the ring with tape did not lessen the danger.

Before an order was issued, officials canvassed every conceivable religious group. The company did not want to unjustly order the removal of a wedding ring. The green light was received from each church.

The rule was set. Orders were issued. Two weeks later a worker refused to remove his wedding ring. Under the rule, a lateral transfer would be made if another job in the company were available. A thorough search uncovered no job. The man was cut from the payroll.

Miller and Davis consider this kind of firm, but just, discipline essential to the success of any safety program. They see it as vital to the management approach.

Once a program is working smoothly, its effectiveness must be measured. Unrealistic measurement and analysis can obliterate every clearly established principle. Said Davis: "Without more sophisticated measurement methods, we'll continue to flounder about in a sea of uncertainty."

He declared it is totally unrealistic to measure one plant's safety

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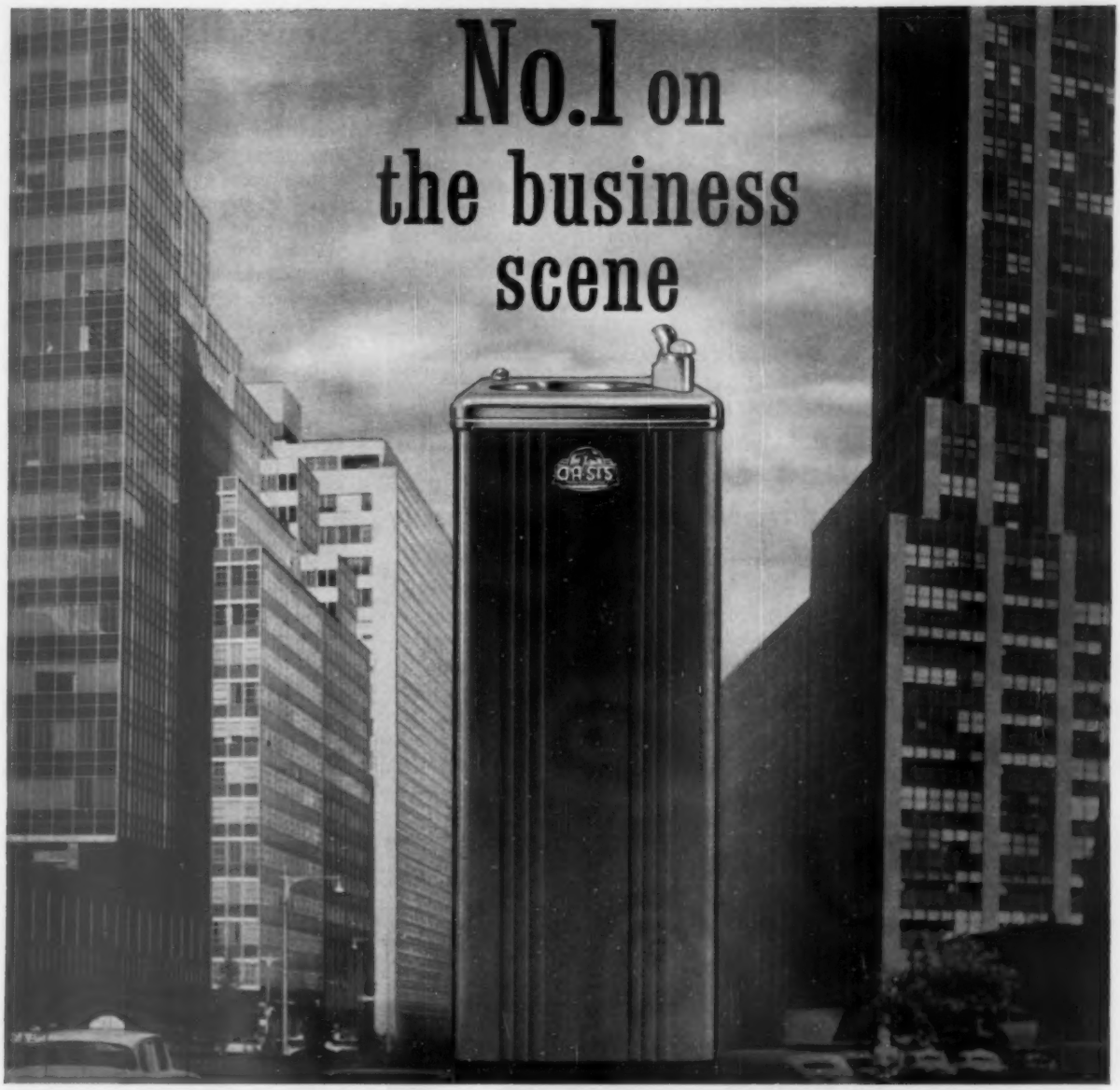

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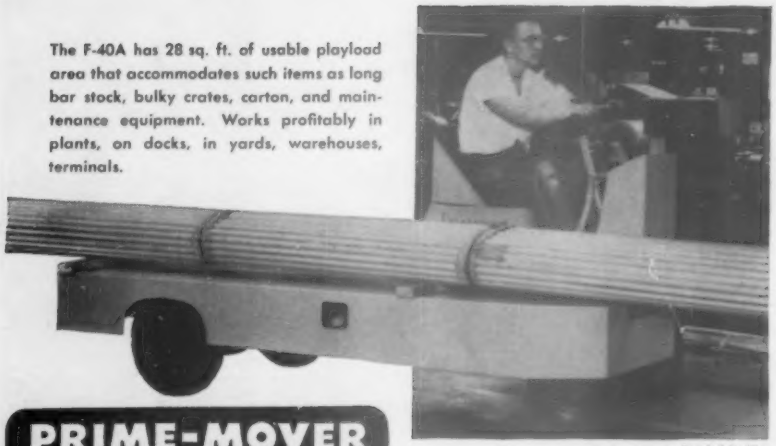

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Begins on page 240

record against another. The same applies to matching one department's record against another. In the first instance, the plants may have entirely different layouts, handling systems, etc. In the second case, foremen may have different jobs and machinery to work with. "To accept accident records at face value is ridiculous," Davis observes.

It's entirely possible, according to Davis and Miller, that with this new safety approach plants could operate 10 or 12 million man-hours without an accident. On the surface, it seems this kind of safety performance could spell *finis* to the safety man.

Not so, the two executives emphasize. The management-oriented program leaves the safety man free to go beyond mere accident prevention. Indeed, he's free to work toward total loss control.

"This approach has other definite advantages that go beyond safety as such," Davis claims.

For example, it helps managers:

- Gain greater acceptance of their leadership.
- Re-establish their initiative.
- Improve employee relations and discipline.
- Improve productivity.

"Of course," says Davis, "it's not enough just to say managers are responsible for safety. They must be taught what their responsibilities are." He listed: developing safe working conditions; integrating safety training with job training; encouraging employee participation; enforcing safety rules.

TOMORROW: A HARD CHALLENGE

In a speech before a national gathering of safety men last year, Davis said: "Our most pressing challenge (in the future) is to identify and define the true nature of the safety job."

And more recently in New York he had this to say about the future of safety in the plant: "We must arrive at a day when the safety man will enter the plant floor only when he's needed to help solve a problem. But before this can happen, management must be convinced that safety is good business."

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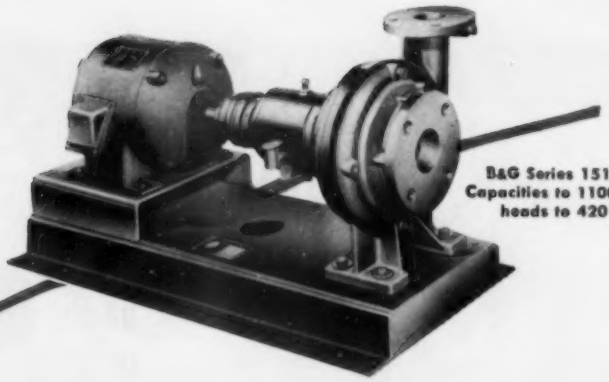

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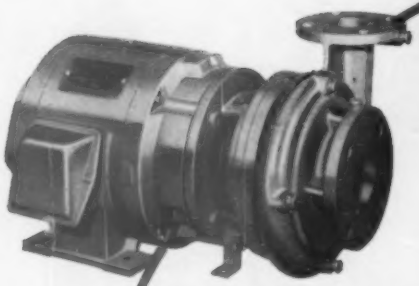

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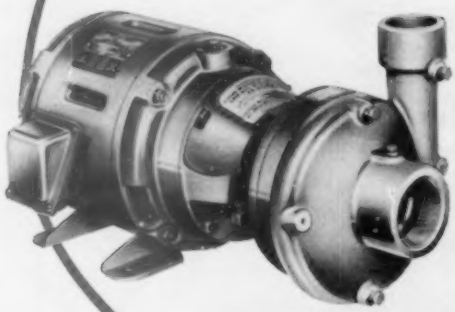

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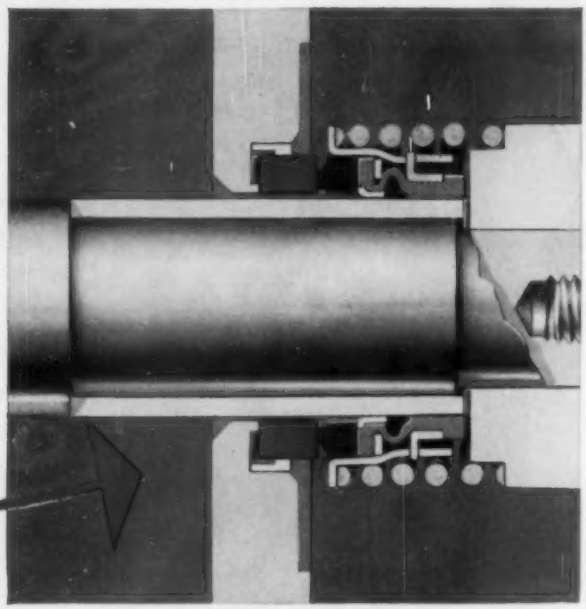

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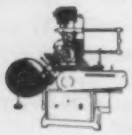

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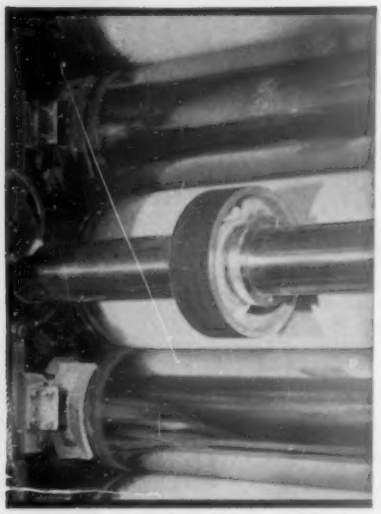

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BOOKS

The mark of a good manager

With all the *self*-help books on the market these days, a manager may easily forget that one of his primary jobs is to develop *someone else* to step into his shoes. Good subordinates are too often thought of as a chance occurrence—something you may inherit with a new job, if you're really lucky.

Developing Competent Subordinates hardly bothers with this obvious fallacy. Good subordinates are the mark of a good manager, and the book dives right into the problem of developing these people. It's crisply written, full of practical advice. It covers managerial action in these five logical steps: selection, on-the-job training, delegation, job rotation, and counseling.

Probably the most refreshing facet of the book is its level-headed, realistic approach to paternalism. For example, the author fires a long-needed blast at the manager-turned-amateur-psychologist:

"This is the age of the counselor —the expert in human relations— and of the advisor, who are prepared to give advice on almost any subject you can name from how to keep a marriage off the rocks to what to do about the mother-in-law who has moved in, bag and baggage. It is also the age of the neurotic, who seeks help on a variety of personal problems that no one can do much about except the neurotic himself, and of the amateur psychologist— that is, anyone who has the strength to lift a cocktail glass at a party and who believes that he is competent to discuss in highly professional language everything from an Oedipus complex to why so-and-so's boyhood rejection by his father has caused him to drink and lose all of his jobs. This is an age when America's population is split roughly into two groups, the advisors and the advised. So it is no wonder that the question of what to say to the troubled employee has become a problem to many managers."

But there are realistic guidelines to avoiding helpless entanglement in subordinates' personal affairs—even while aiding their professional development. The author covers these in 128 fast-reading pages. More verbose writers often take four times as much space to say much less. (Reviewed by R. L. Grant)

Developing Competent Subordinates, by James M. Black. American Management Assn., Inc., 1515 Broadway, New York 36. 128 pages. $4.50 ($3 for members).

Decision making

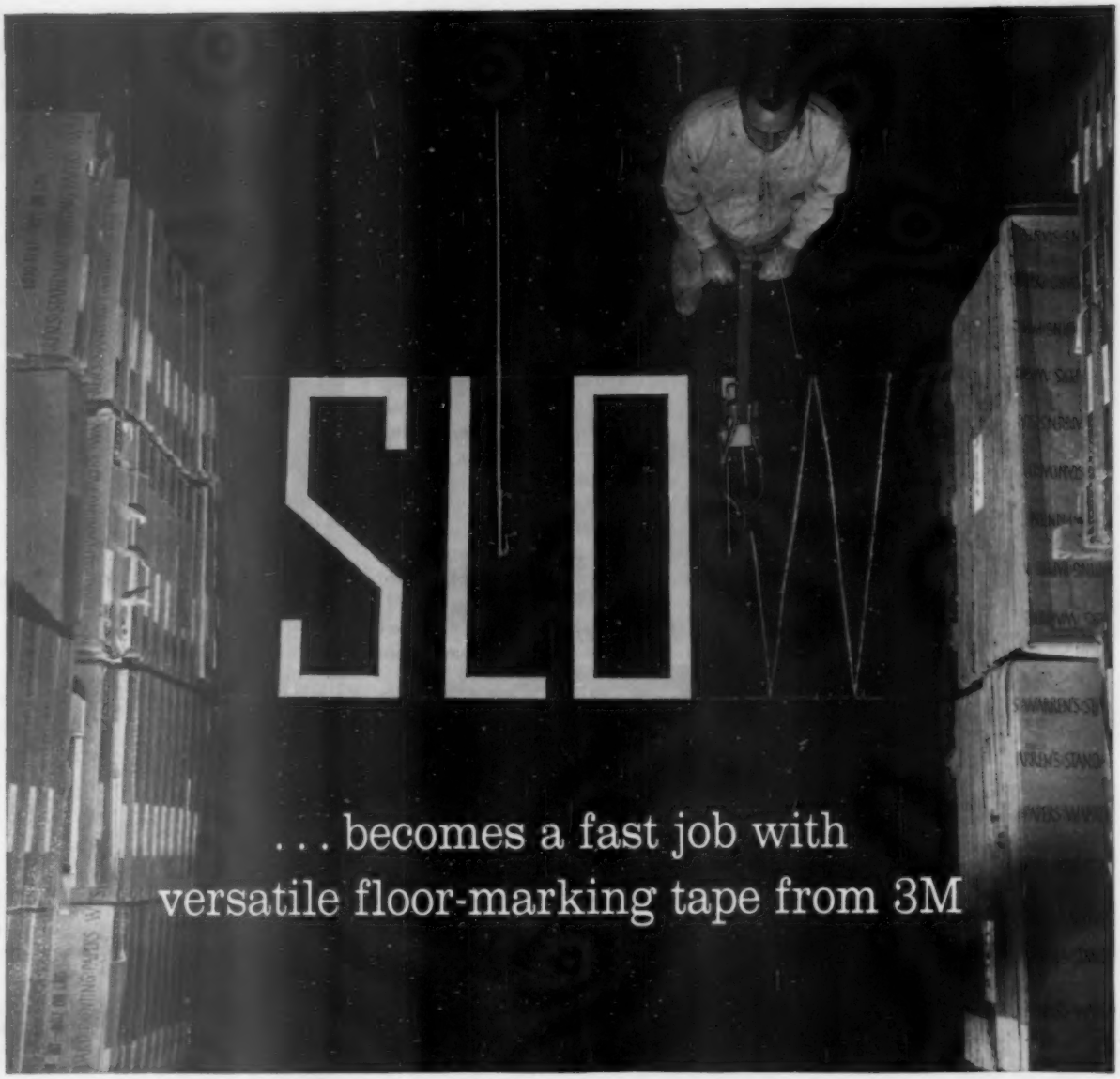
Here's a book with considerable appeal for the manager intent on sharpening his skills. The appeal of *The Process of Management* derives from the really excellent case studies woven into the text. Unlike the ordinary studies which over-simplify to underline points, the cases in this book are by no means duck-soup exercises. They require you to make choices between two—or more— rights. Such choices can tax the wits of top-drawer executives. But this kind of choice is much more realistic than those with the right way and the wrong way clearly spelled out. In fact, it's the kind of choice that, by and large, you're paid to make.

As a result, the book's case material is not only challenging and stimulating, but effective. It can really teach, rather than just reinforce what the reader has already been told. Warmly recommended for the man on his way up.

The Process of Management, by William H. Newman and Charles E. Summer, Jr. Prentice-Hall, Inc., Englewood Cliffs, N.J. 675 pages. $10.50.

Management's role

The reader who wants an over-all view of management's role in developing, organizing, coordinating, and controlling the manufacturing enterprise will find it in *Management of Industrial Enterprises.* The value of this revised edition is threefold: (1) It presents in one place the techniques that stimulate production, in-



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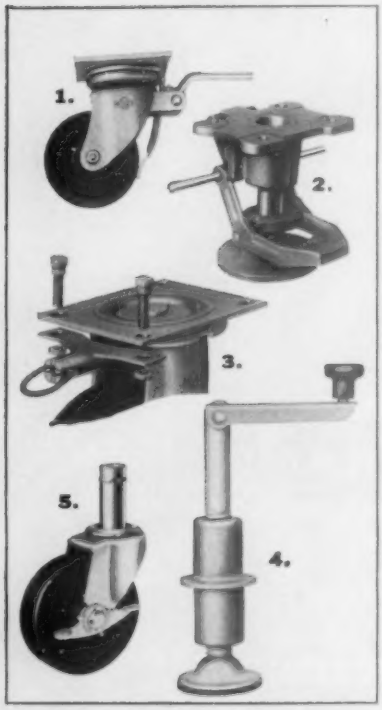
MATERIALS-HANDLING NEWS

NEW AND UNUSUAL APPLICATIONS OF BASSICK CASTERS THAT MIGHT BE ADAPTED TO YOUR HANDLING PROBLEMS

5 WAYS TO MAKE CASTERS MORE USEFUL

These Bassick optional features and accessories can help you solve a wide range of materials-handling problems.



1. Combination wheel brakes and swivel locks—available on the popular Bassick "H99" truck caster and Series "87" and "99" scaffolding casters. Can hold a wide variety of portable equipment and stands securely in position. **2. Separate position locks**—compress against the floor to lock equipment securely in place. Position locks step up flexibility and versatility of trucks, maintenance and assembly stands and portable equipment. **3. Detachable swivel locks**—can be added at any time to 6" and 8" Bassick "H99" and all sizes of "S99" that are equipped with a notched ring to accommodate the lock. **4. Levelizing jacks**—provide an economical, practical way to level and stabilize portable equipment. Function on rugged screw-jack principle, operated by folding crank. Five ton capacity, each jack. **5. Wheel brakes** alone are optional on a great many casters, including the series "68" scaffolding caster shown here. Brakes are easily engaged or released by a touch of the hand or toe.

Can Casters roll you out of a profit squeeze?

A leading financial daily recently reported that efficient warehousing and materials-handling had saved one manufacturer an estimated $300,000!

Today, more than ever, streamlined materials-handling is providing industrial leaders with an opportunity to cut costs, increase profit margins.

Bassick casters are playing a big part in this trend. In the larger plants and warehouses, Bassick casters make possible more efficient, longer lasting, more economical operation of fully-automated power pulled drag lines. And a tremendous variety of other Bassick models are cutting costs in lighter applications.

10,000 CASTERS

Bassick, world's largest caster maker, offers more than 10,000 casters and floor protection items. Whatever your caster needs, in factory, warehouse, office, retail store, hospital or institution, or home, there's sure to be a Bassick that's exactly right for you.

Bassick truck casters save floors, cut maintenance. They'll help you widen "profit squeeze" between costs and sales.

"File-Hard" bearing races mean long life, low maintenance

This easy-to-make file test shows the extra hardness of Bassick swivel bearing parts.

Bassick cold-formed steel casters will pass the test with flying colors. They're fully case hardened to 15N90 Rockwell for years-longer service. This means swivel bearing balls do not penetrate raceways.

Try the "file test" on these outstanding casters:

"H99"—combines easy swiveling, easy rolling and ability to take roughest abuse. Load capacities up to 900 lbs. per caster.

"68"—Light loads move easily on Series "68" plate casters, featuring unique Bassick "Diamond-Arrow" two-level ball race construction. Loads to 200 lbs. per caster.

"S99"—a SUPER swivel caster, built to take the abuse of power pulled applications. Load capacities range up to 2500 lbs. per caster.

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Begins on page 250

BOOKS

crease quality, reduce costs; (2) it points out the advantages, pitfalls, and limitations of these techniques; and (3) it stresses the need for standards of performance.

Management of Industrial Enterprises (rev. 4th ed.), by Richard N. Owens. Richard D. Irwin, Inc., Homewood, Ill. 724 pages. $10.60.

Production Control is an extensively revised edition of an earlier textbook. Strong points include many good, and some excellent, case studies from industry, a clear introduction to operations research methods, and a fairly comprehensive review of the basic principles of production control. The book boasts some very good material on the inter-relationships of production control with sales, various types of engineering, materials management, maintenance, personnel, accounting, quality control. Also there are plenty of sample forms and organization charts.

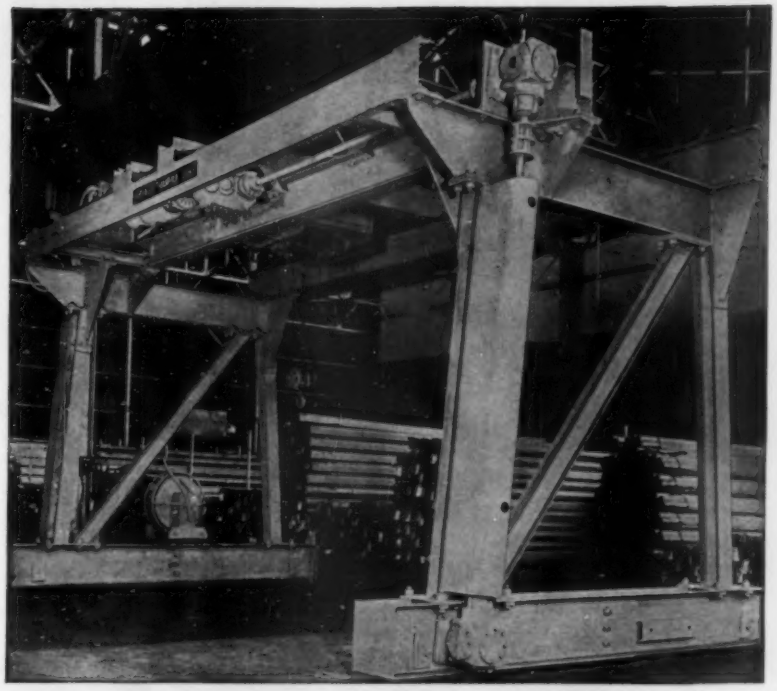
Production Control (2nd ed.), by William Voris. Richard D. Irwin, Inc., Homewood, Ill. 425 pages. $7.20.

Nondestructive Testing Handbook contains an exhaustive treatment of the means of testing materials, parts, components, and structures without impairing serviceability. Prepared under the auspices of the Society for Nondestructive Testing, the handbook gives policy advice to top management, critical guidance to engineers, and practical instruction to technicians. This is a real broad work, but one with plenty of detail.

Nondestructive Testing Handbook, 2 vols., ed. by Robert C. McMaster. Ronald Press Co., 15 East 26th St., New York. 1907 pages. $24.

Water Treatment For Industrial and Other Uses is a rewritten and expanded edition of a comprehensive reference book. The new edition, like the old, is highly practical, well-illustrated, and useful to expert and layman alike.

Water Treatment For Industrial and Other Uses, by Eskel Nordell. Reinhold Publishing Corp., 430 Park Ave., New York 22. 598 pages. $12.



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FILMS

The Case of the Missing Magnets demonstrates supervision's role in keeping productivity high. The film reviews basic principles of human relations and the problem of motivating employees to better teamwork. Emphasizes the importance of insight on the part of the supervisor. 16mm, color, sound. For rent or purchase, write to:

The Bureau of National Affairs, Inc., 1231 24th St., N.W., Washington 7, D. C.

Industrial Medicine in Action emphasizes the need to evaluate working conditions in shops to protect workers from toxic chemical agents. Shows hazardous environments in which conditions can affect workers' health. 16mm, color, 29 min. $183.20. Write to:

United World Films, Inc., 1445 Park Ave., New York 29.

The Making, Shaping, and Treating of Steel is a series of six films on steel-making processes. Each covers a complete subject: *The Blast Furnace,* 7¼ min.; *The Open Hearth Furnace,* 7 min.; *The Electric Art Furnace,* 7 min.; *Semi-Finished Steel,* 8 min.; *Hot Rolling of Steel Sheets,* 7 min.; *Chemistry of Iron and Steel,* 14 min. 16mm, color, sound. For loan, write to:

United States Steel Corp., Film Distribution Center 525 William Penn Place, Pittsburgh 30.

Life Insurance—What It Means and How It Works explains how life insurance can help people of all ages. Covers risk-sharing and use of mortality tables; tells why premium levels are different at different ages. 16mm, color, sound, 13 min. For loan, write to:

Association Films, Inc., 347 Madison Ave., New York 17.

How's It Going? is a four-part film program for personnel management. It consists of case studies that use a new approach to some of the factors involved in interviewing. Discussion guides accompany each case. Each discussion session is self-contained training unit about one hour long. 16mm, b&w, sound. $125. Write to:

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Choose from a complete line of Nibroc Quality towels . . . multi-fold, single fold or C-fold, in natural or the super white embossed line. See how Balanced Quality reduces towel cost. Write Dept. F-9, Boston for samples . . . or contact your nearest distributor.

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Stack higher, faster . . . get full use of all potential storage space with a Yale KG-51. Low cowl lets operator see what he's doing, increases efficiency. Dry straight clutch and fluid coupling or fully automatic transmission, power steering. Heavy-duty, self-adjusting self-energizing hydraulic brakes. High lifting speed. Fingertip controls for convenient and efficient operation. High stacking. Cap.: 3000 to 10,000 lbs.

Move bulky, heavier loads faster . . . with one man and a Yale G-3 gas truck. Low center of gravity and heavily constructed frame give stability previously impossible in trucks of this capacity. Widely spaced dual lift cylinders provide maximum visibility for greater safety and operator efficiency. Travel speeds to 20 mph; fully loaded lift speeds to 60 feet per minute. V-8 engine. Power steering. Easy fork adjustment. Cap.: 15,000 to 22,000 lbs.

It's time to look at the

Time to look at the profits lost through wasted space, wasted manpower, excessive handling movements, production delays and other drains caused by an obsolete materials handling program. Other companies are looking . . . and plugging loopholes fast with modern Yale gas trucks. Here are a few of the ways you can save with Yale equipment, too.

Meet production schedules . . . step up operator efficiency. Compact Yale G-5 gas truck packs plenty of muscle for big loads. Lifts at 55 fpm fully loaded. Two-speed, fully automatic transmission, power steering, with channels equipped with roller bearings to reduce friction in lifting and lowering. Accumulator reduces road shock impact on truck and load. Vacuum-boosted, hydraulic brakes. Cap.: 15,000 to 22,000 lbs.

Just right for lighter loads. Nimble, highly maneuverable, Yale G-52 is ideal for handling lighter loads on floors, elevators, trailers . . . and in cramped quarters! Yale advanced-design features include 31½ hp power plant, straight clutch or exclusive fluid coupling operation, fingertip lift and direction controls for maximum operator efficiency. Note the short overall length and width. Cap.: 2000 to 4000 lbs.

high cost of hidden costs

When you modernize with Yale gas trucks you don't just add "new trucks" . . . you get the savings and extra productivity of the *right* trucks doing the *right* jobs. For the Yale line is the broadest in the industry. Yale experts can zero in on recommendations objectively . . . recommend units that meet *your* needs for speed, efficiency, capacity, economy, lifting heights, ease of maintenance.

You get savings and convenience of the *right* financial arrangements, too. Choice of rental plans for peak load situations, flexible leasing and payment plans. See your Yale Representative. Or write: Yale Materials Handling Division, Dept. G-106, Philadelphia 15, Pa. A Division of The Yale & Towne Manufacturing Company.

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OUR 99TH YEAR

NORTH WALES, PA.

ADVERTISERS' LITERATURE

Offered in ads received up to 5th of last month for this issue. For items you want, circle numbers on Reader Service Card.

PLANT SITE

275—Western Pennsylvania. Two booklets: plant location services, and available plants and sites. West Penn Power.

276—Nebraska. Facilities Register—an electronic index of suppliers, sub-contractors. Northern Natural Gas Co.

277—Toledo, Ohio. All about plant location services in Toledo-Northwestern Ohio area. The Toledo Edison Co.

MECHANICAL

287—Dihedral couplings. Catalog shows wide range of angular and offset capacities. Ajax Flexible Coupling Co.

279—Sheaves. New design manuals on Multi-V, Multi-Wedge, and Positive Drives with sheaves. Worthington Corp.

280—Bearings. Bulletin covers SC and SCM ball-bearing pillow blocks for normal and medium duty. Dodge Mfg. Corp.

281—Drives, couplings, clutches. Bulletins give complete data on types, capacities, etc. Dodge Mfg. Corp.

MAINTENANCE

282—Visible records. Information on mistake-proof preventive maintenance systems. Acme Visible Records, Inc.

283—Lubricating equipment. Need facts on pump, timer, centralized lubricating system? Stewart-Warner Corp.

284—Paint. "Slide guide" contains complete data on selection of proper paints. Barreled Sunlight Paint Co.

285—Packings. Catalog describes self-lubricating packings for pumps, presses, other equipment. Greene, Tweed & Co.

286—Paint. Bulletin P-57 contains data on metal coat, high-gloss enamel, primers. The Wilbur & Williams Co.

287—Machine mounts. Bulletin and facts kit on machine mounts, installation, etc. Unisorb Div., Felters Co.

288—Protective coatings. Color-Horizons Systems catalog has 110 color standards, 69 applications. Rust-Oleum Corp.

289—Flexible pipe joints. Bulletin 805 on joints ⅜ to 4 in. O.D., lengths to 36 in. Marman Div., Aeroquip Corp.

290—Protective coatings. Data file has corrosion problems survey, coating selector guide. Pittsburgh Chemical Co.

291—Wrenches. Catalog lists industrial wrenches for wide range of maintenance applications. Snap-On Tools.

292—Paint. Here's information on how to control corrosion, deterioration, etc. Truscon Laboratories.

293—Tachometer. Bulletin 103A gives full data on light but rugged hand tachometer. Metron Instrument Co.

294—Paint. Write for catalog that tells about paint for maintenance use. DeSoto Chemical Coatings, Inc.

295—Rust dissolver. Publication "Genius At Work" has many ideas for maintenance men. Kano Laboratories.

296—Engineered maintenance. This 16-pager outlines benefits of programed housekeeping. Puritan Chemical Co.

297—Disposable shop towels. Send for "Guaranteed Cost-Cutting Plan" on disposable wipers. Kimberly-Clark.

298—Vacuum systems. Here's a folder on vacuum equipment for cutting costs. Invincible Vacuum Mfg. Co.

299—Power sweepers. Illustrated bulletins give details on how to reduce sweeping costs. G. H. Tennant Co.

300—Hose. Catalog M5 gives hose data for use with air, water, other fluids, and gases. Raybestos-Manhattan, Inc.

301—Work platforms. You'll want this information on overhead lift-type work platforms. Economy Engineering Co.

302—Roof coatings. Write for booklet, "Aluminum Roof Coatings Make Time Stand Still." Aluminum Co. of America.

303—Paint. Booklet, "Painting With Aluminum", tells of advantages and cost-saving features. Aluminum Co. of America.

PRODUCTION

304—Paint remover. Details on compound for removing paint on production rejects. Gunk Laboratories, Inc.

305—Drafting tape. Catalog (32 pages) lists tape materials that help make your drafting easier. Chart-Pak, Inc.

306—Temperature controller. Bulletin MC-195 fully describes versatile multi-option controller. Fenwal, Inc.

307—Heat exchanger. Bulletin P-60 contains details on structural features and applications. Tranter Mfg., Inc.

Turn the page

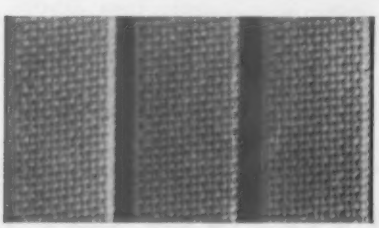
EXIDE POWER PACKAGE

Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa.

85 AMP-HR—ONLY 22⅝ in. HIGH!

Here's the new high in battery capacity for electric industrial trucks—the Exide-Ironclad TSC Battery. It is available right now and it will fit in the battery compartments of your present trucks without modification. It conforms to the design thinking for future trucks as expressed by truck manufacturers.

This battery offers a capacity of 85 amp-hr per positive plate—increased from the previous highest available capacity of 80 amp-hr in the Exide-Ironclad TGS—and still with over-all height of 22⅝ in. The length and width dimensions of the battery are also unchanged. Therefore the new battery occupies the same space as present batteries.



New tubing boosts battery capacity

Side view of tubing magnified twice size shows the fine mesh with thousands of pores for easy flow of electrolyte. Holds active material firmly against loss.

A unique feature of the Exide-Ironclad Battery is the tubular construction of the positive plates. With the square-shaped tube, introduced over a year ago in the TGS Battery, Exide made it possible to get higher capacity from each positive plate through greater area in contact with the electrolyte.

Now, in the TSC Battery, Exide introduces woven mesh tubing, still square shaped, but with higher porosity for easier access of electrolyte. This new tubing is able to hold more active material, which, in addition to the higher porosity, results in higher capacity than ever before. The tubing is of a special nonoxidizing material of proven long life in extensive laboratory tests and field applications.

This increase in battery capacity has been achieved without increasing the height of the battery. Thus you can step up the work capacity of your present trucks without the extra expense of modifying the battery compartments. The Exide-Ironclad TSC is still only 22⅝ in. high. Likewise its specific gravity is still only 1.275. Hence battery life potential remains high.

With the introduction of the Exide-Ironclad TSC, Exide now makes it possible for you to match your particular battery power requirements more closely than ever. If you are ready to buy a new truck or new battery now, talk with your Exide representative about how you can get the maximum power for your dollar.

Only Exide offers so broad a range of battery types: Exide-Ironclad, Exide-Powerclad premium flat plate, and Exide Nickel-iron alkaline (invented by Thomas A. Edison). Exide chargers are available in both motor-generator and silicon rectifier types, in sizes to cover all needs. Exide service men are coast to coast, all factory trained in both batteries and chargers.

Make sure you get maximum economy in your battery power. Write Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa.

Exide®

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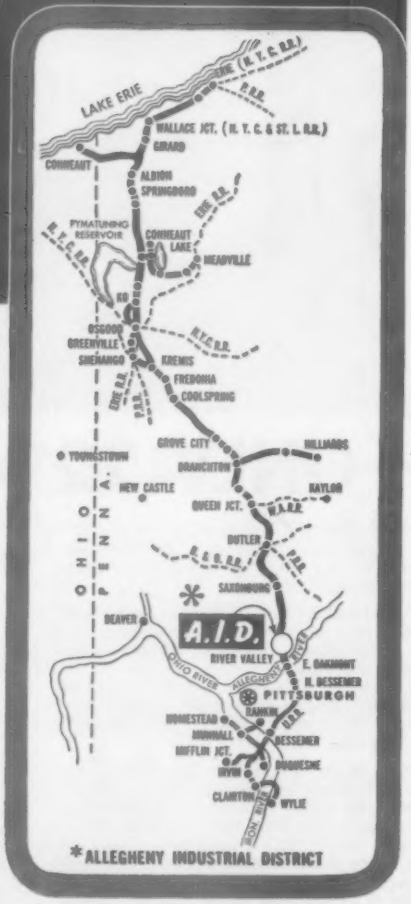

Now is the *right time* to build your new plant or warehouse, and the *right place* is the 100 acres of prime land at the Allegheny Industrial District. Just 14 miles from downtown Pittsburgh, you get fast Bessemer freight and piggy-back service to the nation's principal markets via seven major trunk lines. There's quick access to major highways, too.

Other strategic advantages of an Allegheny Industrial District site are: 24-hour delivery of steel and other basic materials; an ample labor force with skills widely diversified; all utilities to meet any production or warehousing need; located at the center of America's No. 1 market area.

Investigate today! Write or phone for location factors. Complete confidence is assured.

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Begins on page 258

ADVERTISERS' LITERATURE

Offered in ads received up to 5th of last month for this issue. For items you want, use Reader Service Card.

308—Rivitor/Clinchor. Catalogs 646 and 555 offer many standard designs to choose from. Tomkins-Johnson Co.

309—Screwdriving tools. This Catalog 30-C gives data to help you save time and money. Apex Machine & Tool Co.

310—Drill press. Brochure contains complete specifications on new 17-in. model, accessories. Rockwell Mfg. Co.

311—Schedule board. Write for Scheduling Guide that includes full-scale sample chart section. Rol-A-Chart.

312—Industrial TV. Booklet tells about closed-circuit TV system-planning; gives applications. Philco Corp.

313—Staplers, staples. Broadside, "Fasten it Better and Faster," shows many applications. Bostitch, Inc.

314—Air-Power devices. Spot-A-Mation idea file gives complete data, wiring diagrams, etc. Bellows-Valvair.

315—Electronic controls. Catalog describes wide selection of heavy-duty photoelectric equipment. Autotron, Inc.

316—Magnetic separators. Bulletin shows how to protect machinery against dangerous tramp iron. Eriez Mfg. Co.

PLANT SERVICES

317—Water coolers. Latest catalog lists company's new wall-mounted off-the-floor cooler. Halsey W. Taylor Co.

318—Vacuum systems. Catalog 155B gives details on complete systems for dust control. The Spencer Turbine Co.

319—Air conditioning. Bulletin 6023A contains data on new roof-mounted, remote-controlled unit. Dunham-Bush, Inc.

320—Gas-fired heaters. Bulletin GA-61 on downblow models. From 320,000-1,200,000 Btu./hr. L. J. Wing Mfg. Co.

321—Air supply heaters. Bulletin GFAS-60 covers gas-fired heaters in five sizes, 15,000-50,000 cfm. L. J. Wing Mfg. Co.

322—Vending service. Booklet, "How to Design a Food Service for Today . . . and Tomorrow." Automatic Canteen Co.

323—Water coolers. Here's information on 19 distinctive models in pressure or bottle types. The Ebco Mfg. Co.

Turn the page

LOAD LUGGER® System is Key to...

LOAD LUGGER hoisting aboard 14-cu-yd container to be hauled to dump. Many trips are made each day.

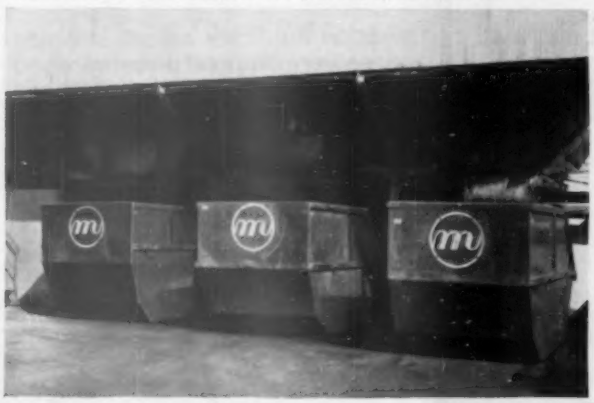
good plant housekeeping...

LOAD LUGGER System reduced disposal costs two-thirds at a Chicago plant. Refuse accumulates in LOAD LUGGER containers throughout plant and yards. These are picked up by LOAD LUGGER truck, hauled two miles to disposal grounds and dumped. No more messy handling, sporadic pickups, or wasted truck and driver standby time.

LOAD LUGGER truck dumps 5-ton load of salt into underground storage. *LOAD LUGGER* saved $1,560 annually on this operation alone.

efficient handling and storage...

Michigan plant improved handling and reduced costs with LOAD LUGGER and 25 containers of various types. Installed as part of modernization program, LOAD LUGGER system requires but a single driver, replaces two dump trucks, front-end loader and twelve men. System permits bulk handling and buying, best possible use of space.



better salvage and reclamation...

Greater return is realized on scrap by a Milwaukee company, because different types are carefully segregated into hoppers, then dumped into LOAD LUGGER containers. Other LOAD LUGGER containers are spotted at various points throughout the plants and yards to receive scrap and refuse.

Find out how the *LOAD LUGGER* System can improve operations, cut costs for you. Write for information and the name of your dealer.

1½- to 16-cu yd capacities

SELF-LOADS AND UNLOADS | **HAULS** | **SELF-DUMPS**

Factories: Milwaukee, Wis. • Hillside, N. J.; Lancaster, Pa.; Cleveland, Ohio; Modesto, Calif.

THE HEIL CO.
MILWAUKEE 1, WISCONSIN

LOAD LUGGER and HUGE HAUL SYSTEMS

Sales Offices: Hillside, N. J.; Washington, D. C.; Atlanta, Ga.; Cleveland, Ohio; Chicago, Ill.; Milwaukee, Wis.; Kansas City, Mo.; Denver, Colo.; Dallas, Texas; Los Angeles, Calif.; Seattle, Wash.

SCIENTIFIC PACKAGE SMASHING PROVES AVISTRAP CAN MATCH STEEL STRAPPING

Container Laboratories, Inc., New York, recognized expert in package research, reports Avistrap® Cord Strapping can match or better the performance of steel strapping in comparable applications. Behind this statement is a carefully-observed series of independent tests, comparing performance of Avistrap in ⅜ in. and ⅝ in. widths with performance of .015 steel strapping in the same widths, in package reinforcement, bundling, and palletizing. A comparison in terms of tensile strength, elongation, and energy required to break was also made. This showed Avistrap's amazing ability to keep on absorbing energy without breaking, long after comparable steel strapping has failed. Container Laboratories, Inc. designed the tests to duplicate actual shipping situations. Packages were dropped on corners and edges, subjected to an incline impact test, and vibrated for hours with a force equal to their own weight. The test program was carried out without any guidance or instructions from American Viscose Corporation.

A summary of test results, as approved by Container Laboratories, Inc., is available on request. Write to Dept. T. Ask for "Evaluation Booklet."

AVISTRAP® CORD STRAPPING

AVISTRAP® CORD STRAPPING*

*Patents pending.

AMERICAN VISCOSE CORPORATION, INDUSTRIAL PACKAGING DEPT. B, 1617 PENNSYLVANIA BLVD., PHILA. 3, PA.

District Offices: Atlanta, Ga. • Boston, Mass. • Charlotte, N. C. • Chicago, Ill. • Columbus, Ohio • Dallas, Texas • Los Angeles, Calif. • New Orleans, La. • New York, N. Y.

For more facts Circle 572 on Reader Service Card

Begins on page 258

ADVERTISERS' LITERATURE

Offered in ads received up to 5th of last month for this issue. For items you want, use Reader Service Card.

324—Steel equipment. Catalog illustrates diversified line of steel shop equipment. Lyon Metal Products, Inc.

325—Flexible tubing. Catalog ID-100E has data on flexible exhaust and blower tubing. Universal Metal Hose Co.

326—Safety cans. Manual (76 pages) on flammables engineering fundamentals, safety equipment. Protectoseal Co.

327—Valved couplings. This 62-pager covers sizes and types of quick-connect, disconnect couplings. Snap-Tite, Inc.

328—Charcoal filters. Bulletin T-373 gives details on filtering agent for air purification. Barnebey-Cheney.

329—Compressor. Catalog 185 on CMB-2 model rated at 400 bhp. Others from 75 to 8000 bhp. Clark Bros. Co.

330—Plant protection. Here's data on control panel for safeguarding doors, gates. Minneapolis-Honeywell.

331—Compressor. Short-form catalog describes complete line of stationary compressors. Atlas Copco.

MATERIAL HANDLING

322—Hoists. Literature on complete line of electric, air, and chain block hoists. Manning, Maxwell & Moore, Inc.

333—Slotted angle. Idea book shows many uses for slotted angle. Equipto Div., Aurora Equipment Co.

334—Clip-type shelving. Catalog on Erectomatic shelving that needs no tools. Columbia-Hallowell Div., SPS.

335—Wire rope. This booklet describes structural features, applications. Wire Rope Div., John A. Roebling's Sons.

336—Steel shelving. Here's fact-packed catalog on rapidly assembled shelving. No bolts needed. Borroughs Mfg. Co.

337—Hoists. Bulletin covers job-mated hoists; capacities, ¼ to 30 tons. Shepard Niles Crane and Hoist Corp.

338—Vertical conveyors. Brochure tells how system can solve vertical handling problems. Standard Conveyor Co.

339—Unitized containers. Illustrated brochure shows one-piece molded plastic containers. G. B. Lewis Co.

Turn the page

MAGLINER MOBILE LOADING RAMPS go where you go . . . provide a loading dock *where* you need it, *when* you need it! Magnesium-light construction for easy one man handling—anytime, anyplace. The result: easier work, happier men . . . *lower cost loading*! If you load or unload trucks or railcars from ground level, you'll want a copy of Magline's Bulletin—"Everyday Ground-Level Loading Problems and How to Solve Them."

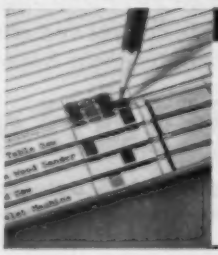
Write Today for Bulletin DB-211

Magline Inc.,
P. O. Box 249,
Pinconning, Michigan

For more facts Circle 573 on Reader Service Card

Prevent burned out motors that burn up profits

When a dry, forgotten bearing burns out a motor, it can cost thousands of dollars in lost production time. That's why profit-conscious management so often turns to ACME VISIBLE to make preventive maintenance forget-proof. Every need of every motor and machine is visibly scheduled and signaled as shown at right. Service records, cost records, spare parts inventory, stay with maintenance cards. For less downtime and more profitable on-time production, send coupon.



ACME VISIBLE

ACME VISIBLE RECORDS, INC.
3109 West Allview Drive
Crozet, Va.

Please supply more information on Acme Visible money-saving PM control.

NAME _____

ADDRESS _____

CITY _____ ZONE ___ STATE _____

For more facts Circle 574 on Reader Service Card

FOR LOW-COST, DEPENDABLE FIRE DETECTION ALARM!

Kidde Atmo fire detector tubing

KIDDE ATMO: Ideal for schools, hospitals, plants, public buildings, Kidde Atmo Fire Detecting and Alarm Systems use highly sensitive rate-of-temperature-rise detection tubing. Easy to install, simple to maintain, Atmo systems give fast warning in first stages of fire.

Kidde Fyrindex detection element

KIDDE FYRINDEX: Now — dependable fire detection at the lowest possible cost. Kidde Fyrindex features fast-acting, self-resetting detectors, comes in either rate-of-rise, fixed temperature or combination models.

Both Kidde systems are U.L. and F.M. approved; sound alarms locally, at central station, or at municipal fire headquarters; feature one to one hundred zone control and annunciator panels.

For complete information about Kidde fire detection, write today.

Kidde

Kidde Ultrasonic & Detection Alarms Div.
932 Brighton Road, Clifton, New Jersey
Walter Kidde & Company, Inc., Belleville 9, N. J.

For more facts Circle 575 on Reader Service Card

Begins on page 258

ADVERTISERS' LITERATURE

Offered in ads received up to 5th of last month for this issue. For items you want, use Reader Service Card.

340—Conveyors. Brochure describes engineered material handling flow system control. Rapids-Standard Co.

341—Trolley conveyors. Write for Bulletin 2365 on power-and-free overhead conveyors. Rapistan-Keystone, Inc.

342—Monorails. You'll want 52-page book, "Cost-Cutting With Monorails and Cranes." Louden Machinery Co.

343—Chain. Bulletin 14-A on electrically flash-welded alloy steel chain—$\frac{9}{32}$ to 2 in. S. G. Taylor Chain Co.

344—Loading ramps. Catalog DB-211, "Everyday Ground-Level Loading Problems and How to Solve Them." Magline.

345—Pallet truck. Data sheets on new model RP truck—4000 and 6000 lb. Automatic Transportation Co.

346—Levelling lifts. Here's information on hydraulic power lifts for many uses. Elevator Div., Dover Corp.

347—Pneumatic conveying. Booklet 143-B covers conveying system for bulk materials. Spencer Turbine Co.

348—Containers. Catalog lists containers made of tough, vulcanized fiber. National Vulcanized Fibre Co.

ELECTRICAL

349—Switch trip controls. Catalog 65 has data on trip control for punch presses. Micro Switch Div., Honeywell.

350—Motors. This brochure, "The Fine Art of Building Better Motors," is yours for the asking. Elliott Co.

351—Speed drives, controls. Bulletin 2900 covers automated speed drives, precision controls. Louis Allis Co.

352—Relay. Catalog GEA-7329 for details on new 10-amp., 300-volt industrial relay. General Electric Co.

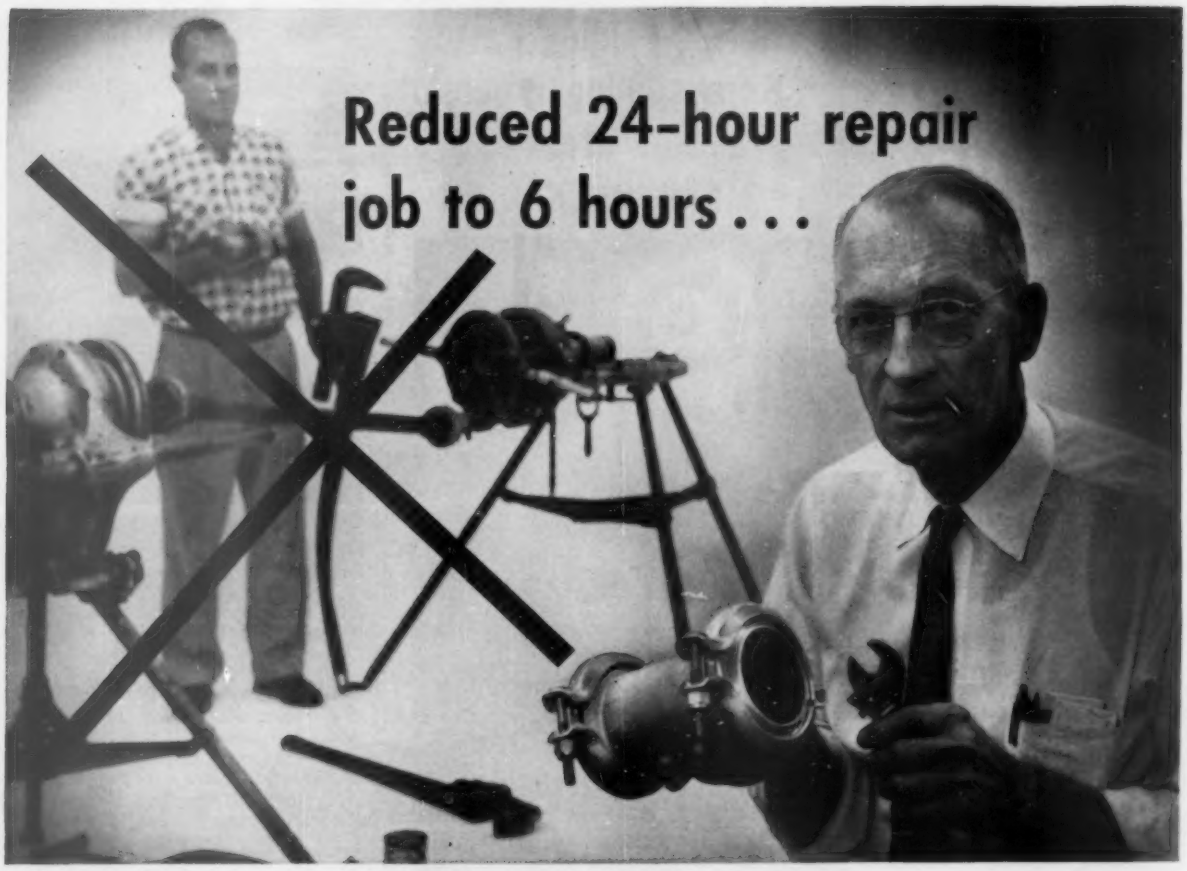
353—Motor starters. Publication LO-70-S211 describes across-the-line starters. Come in ten sizes. Cutler-Hammer, Inc.

354—Cableways. Here's a catalog with information on two new interchangeable trays for support. The Globe Co.

355—Testing instrument. Manual D-62 on insulation testing of cables, wiring, motors. Associated Research, Inc.

Turn the page

FACTORY



MARMAN FLEXMASTER Pipe Joints Cut Replumbing Time 75%

Why use expensive threaders, cutters and heavy wrenches?

Breakdown and replumbing of a vital process water system threatened 75% of a west coast manufacturer's production. The plant engineer cut the time necessary for the job to 25% of that required by ordinary plumbing methods by using Marman FLEXMASTERS.

These versatile units joined pipe without flanging, threading or grooving in the restricted pump pit shown at right and one man did the job with an ordinary hand wrench. Because they allow 4° angular misalignment and accommodate axial pipe movement or length variation, proposed excavation of underground piping was avoided and plant downtime prevented through use of FLEXMASTERS.

Marman FLEXMASTERS are available in sizes from ⅜" to 4" O.D., with lengths to 36", including elbows, tees and crosses. Good for 150 lb. service with a 4:1 safety factor. Temperature range from −40 to +250° F.

Learn how the plant engineer saved his company thousands of dollars on just this one job. Send for FLEXMASTER Bulletin No. 805 and list of distributor locations with details explaining emergency problems encountered in modification of this pumping system. Just return coupon.

FLEXMASTER is an Aeroquip trademark.

Aeroquip

MARMAN DIVISION

11214 Exposition Blvd., Los Angeles, California

Aeroquip (Canada) Ltd., Toronto 19, Ontario

Aeroquip G. m. b. H. Baden-Baden-Oos, Germany

Marman Products are Covered by U.S. and Foreign Patents and other Patents Pending

MARMAN DIVISION, AEROQUIP CORPORATION
11214 Exposition Blvd., Los Angeles, California

Please send FLEXMASTER story.

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State____

Automatic Baling Pressure Control

Solves Folding Carton Scrap Baling Problem at MEAD PACKAGING

This completely automatic BALEMASTER CYCLOMATIC® BALER, installed at MEAD PACKAGING bales 54 tons of scrap folding carton stock per day in the one-man baling department.

Dramatic comparison of the results of two systems of baling in one plant. Note the clean, uniform, dense bales at left which were baled in the BALEMASTER. The loosely packed bale, at right, from the conventional vertical baler, requires wrapping and steel strapping to hold it together.

In a horizontal automatic scrap baler, the back pressure exerted by the scrap against the hydraulic ram determines the density of the bale.

PROBLEM—Since there is such a variance in the friction offered by the various folding carton stocks (e.g. butter cartons, cigarette cartons, tooth paste packages, food containers) it is essential that the back pressure in the baling chamber be maintained at the proper level at all times *to assure uniform, compact high density bales!*

SOLUTION—The correct pressure is *automatically* maintained by the BALEMASTER CYCLOMATIC® BALER at the MEAD PACKAGING plant, through a system of hydraulically actuated devices working in conjunction with the main hydraulic system. This balancing of pressures is instantaneous and *completely automatic* under all conditions. No need for adjusting valves, take-up screws or other time consuming manual controls. Patent applied for.

If you have a scrap handling and baling problem . . . there is a BALEMASTER CYCLOMATIC® SYSTEM made up of standard components so versatile it will meet all your needs to perfection!

Write today for full information

EC EAST CHICAGO MACHINE TOOL CORP.

Balemaster DIVISION OF
EAST CHICAGO MACHINE TOOL CORPORATION
4801 Railroad Ave. • East Chicago, Indiana • Phone: EXport 7-7470

Begins on page 258

ADVERTISERS' LITERATURE

Offered in ads received up to 5th of last month for this issue. For items you want, use Reader Service Card.

356—Fuses. Bulletin FIS on dual-element fuses for loads 0 to 600 amp. Bussmann Mfg. Div., McGraw-Edison Co.

357—Fuses. Bulletin HCS on fuses with 200,000-amp. interrupting rating. Bussmann Mfg. Div., McGraw-Edison Co.

PACKAGING & SHIPPING

358—Steel strapping. Want Packaging Idea Kit on use of power-strapping machines? Signode Steel Strapping Co.

359—Shipping room supplies. "Handy Helper" is guide to better shipping methods. Diagraph-Bradley Industries, Inc.

360—Rust preventives. Two helpful charts give industrial and government specifications. Valvoline Oil Co.

361—Cloth tapes. Brochure describes tapes for full range of cannister and drum-sealing applications. Permacel.

BUILDING

362—Floor topping. Data sheet CP-679 describes new resinous cement coating. Pennsalt Chemicals Corp.

363—Stair treads. Write for new, easy-to-use steel grating and tread catalogs. Kerrigan Iron Works Co.

364—Floor surfacing. Technical data sheets cover non-slip floor surfacer. Comes in five colors. Flintkote Co.

365—Flooring compound. Brochure FC-100 on polysulfide base mortars; many applications. Thiokol Chemical Corp.

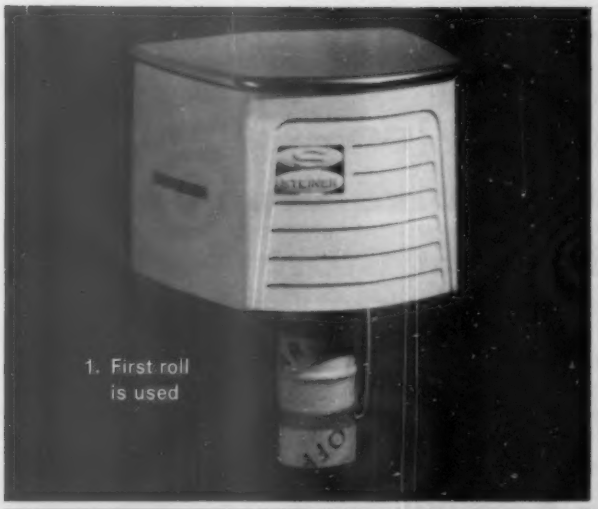
366—Complete buildings. Detailed literature describes steel buildings in ten colors. Stran-Steel Corp.

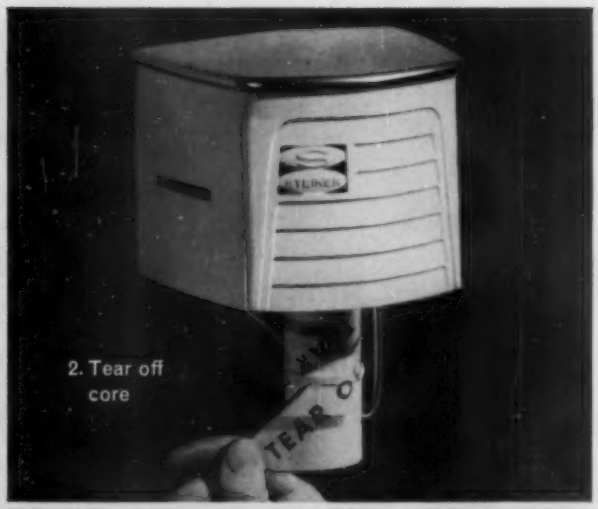
Organization Survey

Factual 12-page study analyzes organization of manufacturing functions in 31 plants, a variety of industries. Attractive color reprints.

Single copies ..... 75¢ each
2 to 24 copies ..... 60¢ each
25 to 99 copies ..... 50¢ each

Write Reader Service, FACTORY, 330 W. 42nd St., New York 36.





The Steiner Tissue-Master . . .

cuts washroom maintenance costs . . . is never empty

The Steiner Tissue-Master two-roll dispenser will lower your washroom maintenance costs, and give you the convenience of a double supply of tissue. Here are the Tissue-Master features that add up to washroom economy for you:

Double supply—The Steiner Tissue-Master holds two rolls of soft, quality tissue. Your tissue supply lasts longer, and the dispenser will never be empty. When the first roll is finished, simply tear off the core and the second roll automatically drops into place.

Less maintenance—The Tissue-Master cuts washroom maintenance time in half as tissue supply lasts longer and less maintenance is required. A view slot tells at a glance when the Tissue-Master needs refilling.

Quality dispenser—The Tissue-Master is made of durable styrene plastic with a clean white finish that resists rust and scratches; never needs painting. A flat chrome top makes a convenient shelf that isn't harmed by burning cigarettes. Tissue theft is eliminated by a sturdy lock. The Tissue-Master is also available in an all metal model.

Complete line—Steiner Company manufactures a complete line of quality paper products and controlled dispensing cabinets for every washroom need. Write today for information on how Steiner products and controlled dispensing can save you more money.

STEINER CONTROLLED ROLL TOWEL DISPENSERS

AMERICAN AUTOMATIC
Semi-Automatic

DRI-MASTER
Manual Operation

SERVA-MATIC
Fully Automatic

STEINER COMPANY
740 Rush St. • Chicago 11, Ill.

STEINER

For more facts Circle 578 on Reader Service Card

Steel for Strength Durability Economy

Armco Pipe Helps Solve Unusual Industrial Storm Sewer Problem

Uncovered here are the unusual solid limestone obstructions encountered at the Royal McBee site.

Same view as at left, after tops of pinnacles were removed and Armco Pipe installed in the trench.

In planning a new typewriter plant for Royal McBee Corporation at Springfield, Missouri, the architect-engineer firm of Giffels & Rossetti, Detroit, found "waves" of solid limestone just below ground level to hinder installation of the storm sewer system.

Several sewer pipe requirements became apparent. (1) Flexibility, (2) Positive connections, (3) Strength to bridge the rock pinnacles. Also, life-expectancy had to be equal to that of the plant.

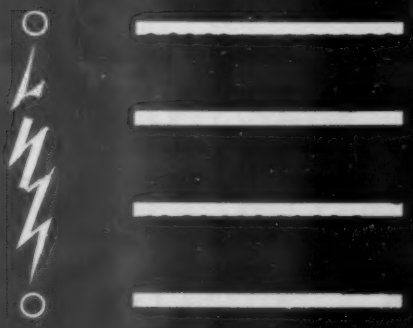
Considering these factors, Giffels & Rossetti said, "Only one pipe material was practical for storm sewers on this plant site, and that was asphalt-coated corrugated metal pipe."

Installed for this storm sewer were 6,210 lineal feet of Armco PAVED-INVERT®, full-coated, pipe in 10 diameters from 8 to 48 inches.

For more data on Armco Corrugated Metal Pipe products for *your* applications, see your local Armco Sales Engineer, or write to Armco Drainage & Metal Products, Inc., 4051 Curtis Street, Middletown, Ohio.

ARMCO Drainage & Metal Products

For more facts Circle 579 on Reader Service Card



Polaroid keeps picture rolls dust-free with PRECIPITRON electronic air cleaning

The Polaroid® Land camera develops its own pictures when the user pulls the film between two rollers. This spreads developing fluid between positive and negative sheets. If dust got into the negative roll during manufacture, it could spot or streak the print at the time of developing.

Polaroid eliminates this hazard by keeping its film manufacturing plants dust-free with PRECIPITRON® electronic air cleaners. These units trap the minute particles of dirt--less than 1 micron in size --that pass right through ordinary mechanical filters. The film is protected from all sizes of airborne dirt down to 1/100 micron.

You can rid your plant of airborne contamination...reduce product rejects...cut housekeeping costs...with PRECIPITRON electronic air cleaners.

They're cheaper to own and maintain than mechanical filters, yet much more efficient. Ask your consulting engineer, or call in Sturtevant application engineers. You can be sure...if it's Westinghouse.

J-80727

WESTINGHOUSE ELECTRIC CORPORATION
Sturtevant Division, Dept. IO-27.
Hyde Park, Boston 36, Mass.

Send me your Precipitron brochure.

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

PHONE_____

®—REGISTERED TRADEMARKS

Westinghouse **Sturtevant Division**

For more facts Circle 580 on Reader Service Card

THERE'S A JOHNS-MANVILLE SPECIFICATION FOR EVERY ROOF INCLINE

Dead level to ½" per ft.
AQUADAM
SMOOTH SURFACE ASBESTOS ROOFS

½" to 6" per ft.
FLEXSTONE
SMOOTH SURFACE ASBESTOS ROOFS

1" to 3" per ft.
ASPHALT GRAVEL SURFACE ROOFS

Dead level to 1" per ft.
AQUADAM GRAVEL SURFACE
BUILT-UP ROOFS

For deck inclines of dead level to 1" per foot:

AQUADAM® GRAVEL SURFACE BUILT-UP ROOFS

Whether gravel is applied by hand as shown below or by the mechanical method you see above... the key word to remember in quoting is AQUADAM. For gravel or slag-surfacing a roof incline of dead level to 1" per foot, over nailable or non-nailable decks, a J-M AQUADAM GRAVEL SURFACE BUILT-UP ROOF specification offers you many advantages.

That's because Aquadam is an unusual bitumen, especially developed by Johns-Manville for use on dead level and low incline roofs. It has exceptional adhesiveness to grip and hold the gravel or slag... and to bond the roofing felts together. Aquadam will wet and adhere to surfacing within a very generous temperature range, and has excellent self-sealing characteristics. Aquadam also offers superior resistance to rain, heat, cold and the thermal shock of sudden change.

You can always quote an AQUADAM GRAVEL SURFACE BUILT-UP ROOF with confidence. You can have equal confidence in the many other specifications available to you as an Approved Johns-Manville Contractor. And, if you come up against *any* specific problem, call your Johns-Manville Representative for free, expert advice. Or, write to Johns-Manville, Box 158, Dept. F-9, New York 16, N.Y. In Canada: Port Credit, Ont. Cable: Johnmanvil.

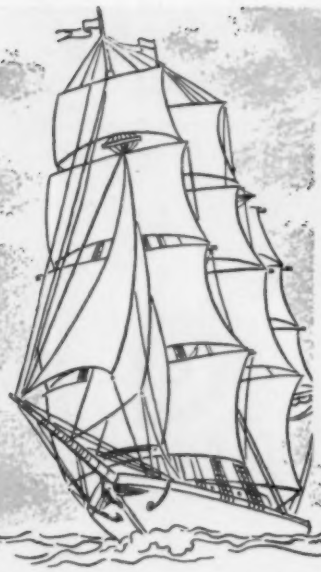
JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS

For more facts Circle 581 on Reader Service Card

Why Rust-Oleum is different—

and what this difference, backed by 35 years of industry proof, means to you!



A Sea Captain developed it . . . Industry proved it!

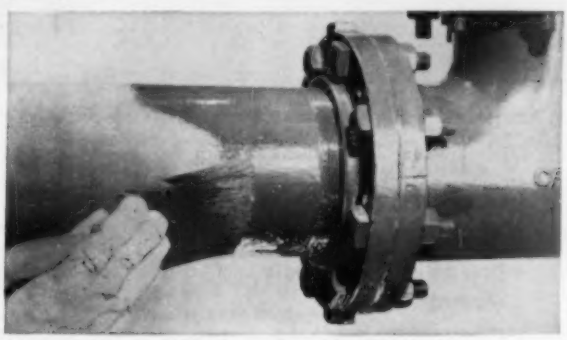
The original Rust-Oleum formula was developed nearly fifty years ago by Sea Captain Robert Fergusson, who became intrigued with the rust-stopping qualities of fish oil early in his career. Creating a *special treatment* for the fish oil, he used the *specially-processed fish oil* as the vehicle in combination with fine rust-inhibiting pigments. The result? A coating that actually *stopped rust* when applied directly over sound rusted surfaces, after scraping and wirebrushing to remove rust scale and loose rust. Possible, because the *specially-processed* fish oil penetrated the rust to bare metal. This was the birth of Rust-Oleum's *exclusive* 769 Damp-Proof Red Primer.

PROVED THROUGHOUT INDUSTRY FOR OVER 35 YEARS

Today, Rust-Oleum in its many systems and colors, has been proved throughout industry for over thirty-five years. This proof by leading industrial users is your assurance of savings in time, money, and metal. Economies made possible by the fact that Rust-Oleum 769 Damp-Proof Red Primer goes right over the sound rusted metal—usually eliminating costly surface preparations. And Rust-Oleum, in its various systems, resists rain, sun, fumes, heat, weathering, chemicals, etc., for lasting beauty over the years.

RUST-OLEUM NEW COLOR HORIZONS SYSTEM

The Rust-Oleum New Color Horizons System introduces a new coating concept to industry. It combines four important factors: (1) the ability to stop rust, (2) smart, modern color harmony, (3) the durability to last and last, (4) ease of application that saves time, money, and metal. See how this system can bring lasting beauty to your plant, machinery, equipment, pipes, tanks, structural steel, fences, etc. Write for complete information or contact your nearby Rust-Oleum Industrial Distributor. He maintains complete stocks for prompt service.



RUST-OLEUM®

There are imitations, but only *one* Rust-Oleum. It is distinctive as your own fingerprint.

STOPS RUST!®

ATTACH TO YOUR LETTERHEAD

Rust-Oleum Corporation
2484 Oakton St., Evanston, Illinois

Please send me the following at no cost or obligation:

- ☐ New Color Horizons Systems Catalog featuring 110 actual color standards and 69 photo applications.
- ☐ Free test sample of Rust-Oleum 769 Damp-Proof Red Primer to be applied over sound rusted surface.
- ☐ Results of radioactive tracing study on Rust-Oleum fish oil penetration.

For more facts Circle 582 on Reader Service Card

Special vented nozzle easily fits beneath conveyor pan.

This Invincible vacuum system has paid for itself in savings in less than one year. Used at Ohio Products Company to clean up spillage from the mold sand conveyor, it:

- Does the job in 4 hours instead of the 16 per week formerly required.
- Eliminates weekend work at time-and-a-half pay, thus saving the equivalent of 20 hours in weekly wages.
- Assures uninterrupted conveyor operation at this Orrville, Ohio, foundry of The Ohio Injector Company.

After castings have been made, mold sand is dumped from flasks through a grate onto a vibrating pan conveyor in a covered trench. Sand spills over the sides of the conveyor, collecting underneath the pan and along the sides of the 180-foot trench. If allowed to build up, it can impair, or halt, conveyor operation.

Before Invincible: Every Saturday, workers removed flooring over sections of the trench and used small shovels to scoop up the sand. This took 16 man-hours (equivalent to 24 hours of wages), yet it was impossible to do a thorough job.

With Invincible: Night-shift worker lets Invincible do the work. Powerful suction draws sand from beneath conveyor pan and other hard-to-get-at spots. Complete cleaning eliminates a possible cause of conveyor failure, and the job takes only 4 hours. In addition, the Invincible is used for general cleaning, thereby further reducing maintenance costs.

Check the Many Uses for Invincibles. Send for new "Invincible Vacuum Equipment" folder. It describes many cost-saving applications.

INVINCIBLE

vacuum cleaner manufacturing co., Dover, Ohio

For more facts Circle 583 on Reader Service Card

NEW PRINCIPLE IN TORQUE CONTROL LOWERS ASSEMBLY COSTS

Rotor announces J-42T torque control air impact wrench with new hydraulic amplifier

- **NEW** unique hydraulic amplifier shuts off tool at desired torque. This exclusive device results in...
- **FASTER** rundown and impacting speed. Cuts job time.
- **MORE ACCURATE** torque control with uniform results. Quick, easy adjustment...tamperproof.
- **ASK FOR DEMONSTRATION** of the J-42T to see how this outstanding development can cut costs on your assembly line.

Write The Rotor Tool Company, 26300 Lakeland Blvd., Cleveland 32, Ohio.

Here's the RIGHT TOOL for YOUR job!

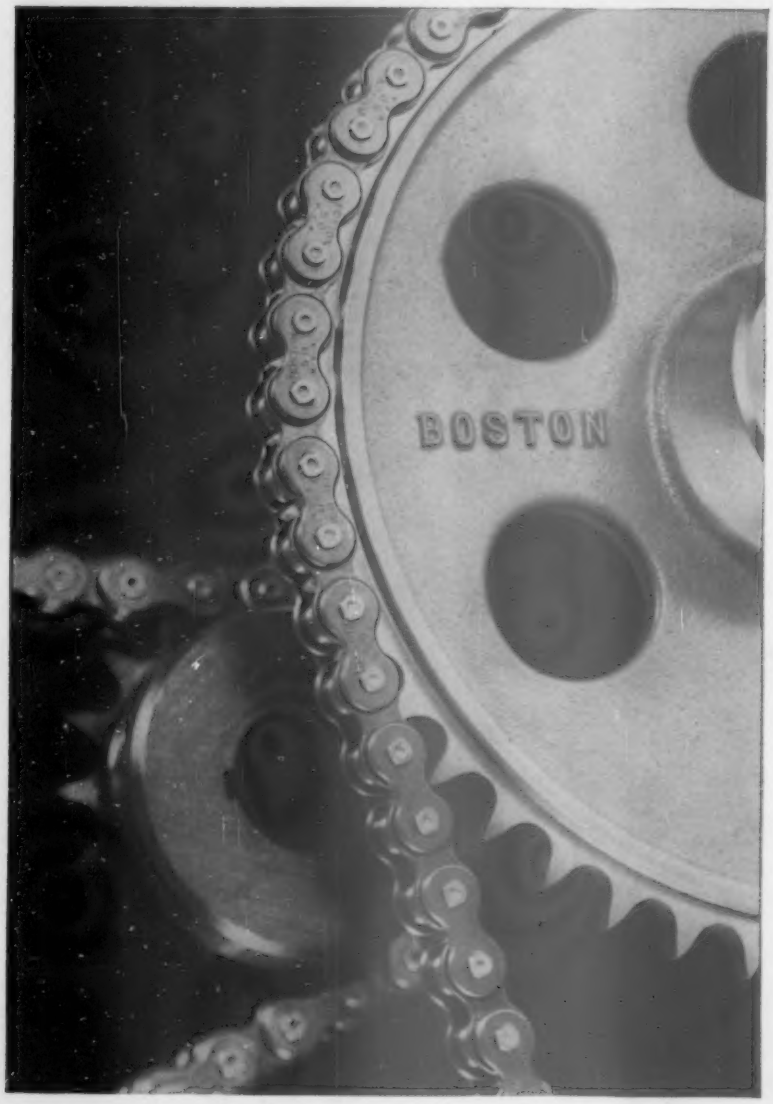
ROTOR TOOLS®

The Rotor Tool Company · Cleveland, Ohio

SUBSIDIARY OF THE COOPER BESSEMER CORPORATION

BOSTON Gear® QUALITY

sprockets and chain



1488 types and sizes. From local stock.
Off the shelf - at factory prices.
For any chain drive 1/4" to 2" pitch -
Roller, Block, Ladder. See Catalog 57.
Design around the quality leader.
IN STOCK at your nearby **DISTRIBUTOR**

BOSTON Gear®

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Quincy 71, Mass.

For more facts Circle 585 on Reader Service Card

SOURCES OF SUPPLY

Suppliers and sub-contractors in the Northern Plains can be pinpointed quickly by the Facilities Register, a unique electronic index of production facilities. Whether yours is a problem of finding new suppliers, contracting for idle machine time, shortening lines of supply, or obtaining better quality and service:

ASK THE MAN FROM THE NORTHERN PLAINS

NORTHERN NATURAL GAS COMPANY
SERVING THE NORTHERN PLAINS ☐ GENERAL OFFICES: OMAHA, NEBRASKA
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FOOD FOR THOUGHT

Coffee is vended nine ways in Canteen's flavor-guarding, all-plastic cups: (1) black; (2) cream only; (3) sugar only; (4) cream and sugar; (5) extra cream; (6) extra sugar; (7) sugar, extra cream; (8) cream, extra sugar; (9) extra sugar, extra cream. And what will you have with your coffee? A meal? Sandwich? Pastry? Cigarettes? Candy? Canteen serves them all.

morale-builder extraordinary

One of America's finest cups of coffee comes from a machine —a Canteen® Coffee machine

When coffee was first introduced to the world, at the end of the 17th century, one of its early advocates said: "It much quickens the spirit and makes the heart lightsome."

Prophetic words! Long, happy experience and hard, factual surveys attest to their truth. A *good* cup of coffee does raise morale, improve efficiency and make the job pleasanter.

We say a "good cup of coffee" advisedly, because a bad cup can have the opposite effect.

What makes Canteen coffee so good?

Many things, beginning with the beans themselves. They must grow in the right places, and they must be picked with care. Of the many varieties from some 43 countries, Canteen selects about seven for its vintage blend. Roasting, cooling and grinding are such critical processes that they are electronically controlled. Ultimately, however, it is the responsibility of the coffee-taster and his sensitive palate to maintain uniformity of body, flavor and aroma.

And, as you know from brewing coffee at home, the coffee-maker is just as critical as the blend. The exclusive *Autobrew* system used in every Canteen coffee vendor measures identical amounts of coffee for each cup, brews each for the same time at the same temperature with the same water action. It will even empty coffee that has stood too long and brew fresh—all automatically.

Result: unvarying quality—a good cup of coffee every time.

Part of a country-wide, automated, 24-hour food and beverage service, Canteen coffee is supplied to suit regional tastes by local operations geared to your needs. Canteen is listed in the Yellow Pages—or use the convenient coupon for further information. Remember, only from Canteen can you get Canteen service.

AUTOMATIC CANTEEN

AUTOMATIC CANTEEN COMPANY OF AMERICA

AUTOMATIC CANTEEN COMPANY OF AMERICA
Merchandise Mart Plaza, Chicago 54, Illinois

Gentlemen:

☐ Please send me ( ) copies of your booklet "How to Design a Food Service for Today . . . and Tomorrow."

☐ I would be interested in meeting a Canteen food facilities specialist. Have him call at his earliest opportunity.

Name_____

Company_____

Street_____

City_____ Zone____ State_____

For more facts Circle 588 on Reader Service Card

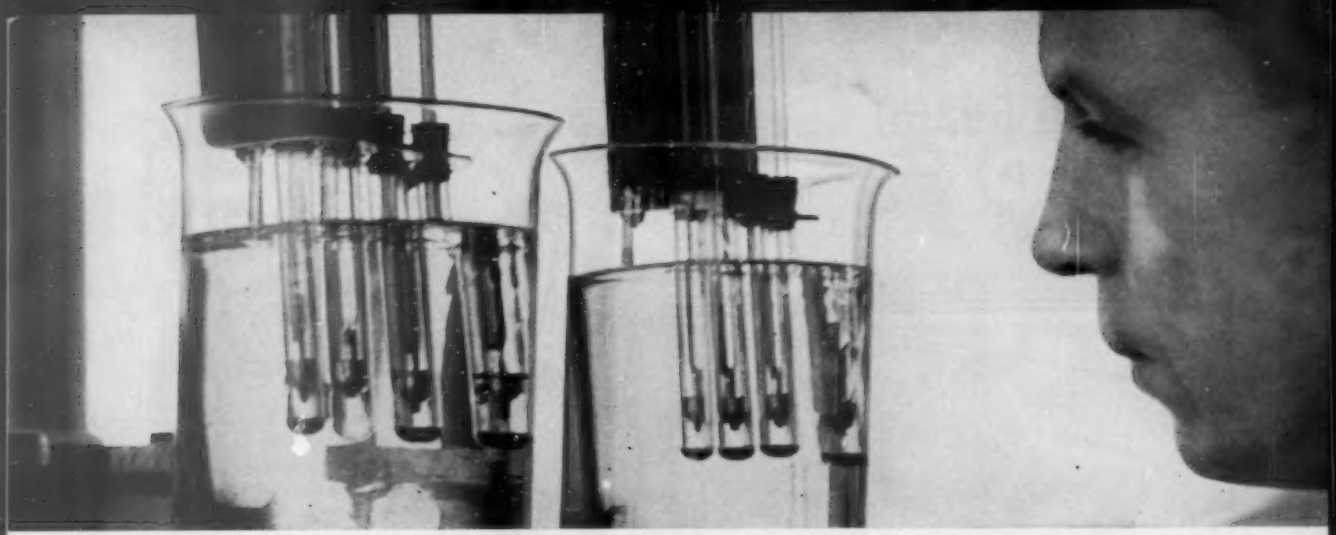
In the time it takes this to make 1 hole in concrete

this makes 5 permanent fastenings

The timesaver on the right is called Shure-Set.® Instead of making holes in concrete (slowly) it makes permanent fastenings (quickly). This easily. Insert a Shure-Set fastener in one end. Strike the other end with a hammer. Less than 5 taps and the fastener permanently anchors a 2 x 4 — or a duct strap, or a junction box, or most anything — to concrete. No drilling. No expansion devices. No powder charge. And no sweat. If your time is money — Shure-Set saves a lot of both — it'll pay for itself first day out on the job. Shure-Set tools and fasteners are available from your local Ramset or Shure-Set dealer. He's listed in the Yellow Pages, under "Tools."

Ramset WINCHESTER-WESTERN DIVISION **Olin**
288-I Winchester Ave., New Haven 4, Conn.

For more facts Circle 589 on Reader Service Card



Dropping point test shows how greases react to heat. Beaker fluid has been heated to 390°F. All greases tested except Darina (second tube from let) have passed from solid to liquid state.

BULLETIN:

Shell reveals the remarkable new component in Darina Grease that helps it save up to 35% on grease and labor costs

Darina® Grease is made with Microgel*, the new thickening agent developed by Shell Research.

Darina lubricates effectively at temperatures 100° hotter than most conventional soap base greases can withstand.

Read how this new multi-purpose industrial grease can help solve your lubricating problems and even save you up to 35% on grease and labor costs.

THERE IS no soap in Darina Grease. No soap to melt away—wash away—or dissolve away.

Instead of soap, Darina uses Microgel—a grease component developed by Shell Research.

What Microgel does

Because of Microgel, Darina has no melting point. It won't run out of gears or bearings.

Compared with most conventional soap-base greases, Darina provides significantly greater protection under adverse service conditions.

Mix water into Darina and the grease does not soften. It shrugs off water—won't emulsify.

Resists heat

Darina will withstand operating temperatures 100° hotter than most conventional multi-purpose greases. It cuts leakage and reduces the need for special high-temperature greases.

Also, Darina resists slumping, thus forming a more effective seal against foreign matter.

Saves money

Shell Darina can reduce maintenance expenses while it protects your machinery. Savings of up to 35% on grease and labor are quite possible.

In some cases lubrication intervals have been extended to double what they were before. Less grease is consumed and less time consumed applying it.

For details, see your Shell Representative. Or write: Shell Oil Company, 50 West 50th Street, New York 20, New York.

*Registered Trademark

SHELL

A BULLETIN FROM SHELL
—where 1,997 scientists are helping to provide better products for industry

For more facts Circle 590 on Reader Service Card

DRAWING BOARD NEWS No. 4

Published by Chart-Pak, Inc., originator of the tape method of drafting

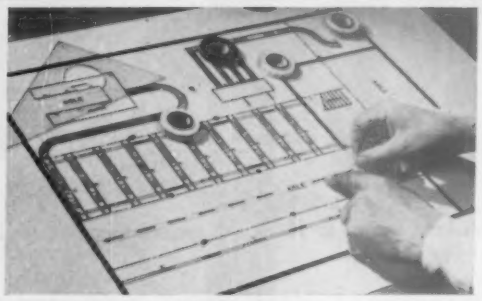
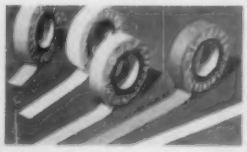


CHART-PAK TAPES LIGHTEN THE LOAD OF OVERWORKED DRAFTSMEN

Chart-Pak is good news for designers and draftsmen. It cuts down on routine "pencil pushing." It allows more time for really creative work.

Lines, bars, shapes, patterns and symbols are all pre-drawn. With Chart-Pak, they come on pressure sensitive tapes and sheets. They just *press* down . . . quickly, neatly.

Even curved lines, as small as ¼" wide can be "taped on." And Chart-Pak is "goof-proof." It is easily removed for corrections . . . yet won't come off accidentally.



NEW TAPES FOR BETTER PHOTOGRAPHY

New "matte surface" acetate fibre taps introduced by Chart-Pak, reproduce "clean as a whistle." They are designed to eliminate highlights and "hot spots" in photo-reproduction—and are extra thin, too, to eliminate edge shadows. The matte finish can be written on, with pencil or ink. Widths from ¼" to 2"—in choice of ten colors.

Chart-Pak helps Budd Company keep track of costs, operations

Charts of important variables in four Budd plants are kept up to the minute the easy way — with Chart-Pak Materials.

Popular everywhere . . . Many leaders of American industry use Chart-Pak Materials extensively. For example: American Bosch Arma; American Cyanamid Company; Grumman Aircraft; Florida Power & Light; Kaiser Aluminum and Chemical Corp.; Michigan Bell Telephone; Smith, Kline, & French Laboratories; Union Carbide; Western Electric; plus many, many more.

NEW! "TAPE-SAVER" PACKAGE

WRITE FOR FREE CATALOG OF Chart-Pak pressure-sensitive materials. It's powerful "medicine" for overworked draftsmen!

CHART-PAK, INC.

ORIGINATOR OF THE TAPE METHOD OF DRAFTING

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Dealers in principal cities in U. S. and Canada

For more facts Circle 591 on Reader Service Card

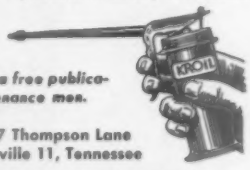
Don't spoil it. KROIL it!

Don't ruin a valuable piece of equipment merely because some part is rusted tight. Apply *KROIL*, the amazing new chemical lubricant that creeps into millionth inch spaces (proved by laboratory tests), **dissolves rust, supplies necessary lubrication and . . .**

Loosens Frozen Parts

18,000 of America's leading plants can't be wrong. They have used KROIL for ten years and depend on it to save expensive labor and valuable parts. They say: "Kroil loosened bushings after a 12-ton press had failed" . . . "on repairing heat treat trolleys formerly destroyed every nut. Now Kroil saves them all, and time, too."

You too can get these results. Try KROIL on money-back basis. Gallon, $4.35; with Kroiler squirt gun, $5.25, f. o. b. factory.



Ask for GENIUS AT WORK—a free publication full of ideas for maintenance men.

KANO LABS. 1067 Thompson Lane Nashville 11, Tennessee

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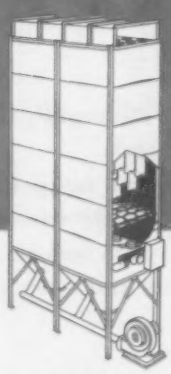

Clears your dust problems with 99%-PLUS efficiency!

DUALAIRE

Jet-Cleaned Filter

In your operation, if filtration is judged the best way to clean incoming air — or remove dust and fumes from exhaust air and gas — a **Dualaire** by Western Precipitation will do the job best.

Constantly efficient . . . at virtually 100% . . . the **Dualaire** cleans itself — without jarring or rapping. It uses the patented Hersey reverse air-jet method — assuring minimum maintenance and economical operation.

WRITE FOR MORE INFORMATION to Western Precipitation, 1000 W. 9th St., Los Angeles 54, Calif. (In Canada, write 8285 Mountain Sights Ave., Montreal, P. Q.)

DUST AND FUME CONTROL SINCE 1907

WESTERN PRECIPITATION

DIVISION OF JOY MANUFACTURING COMPANY

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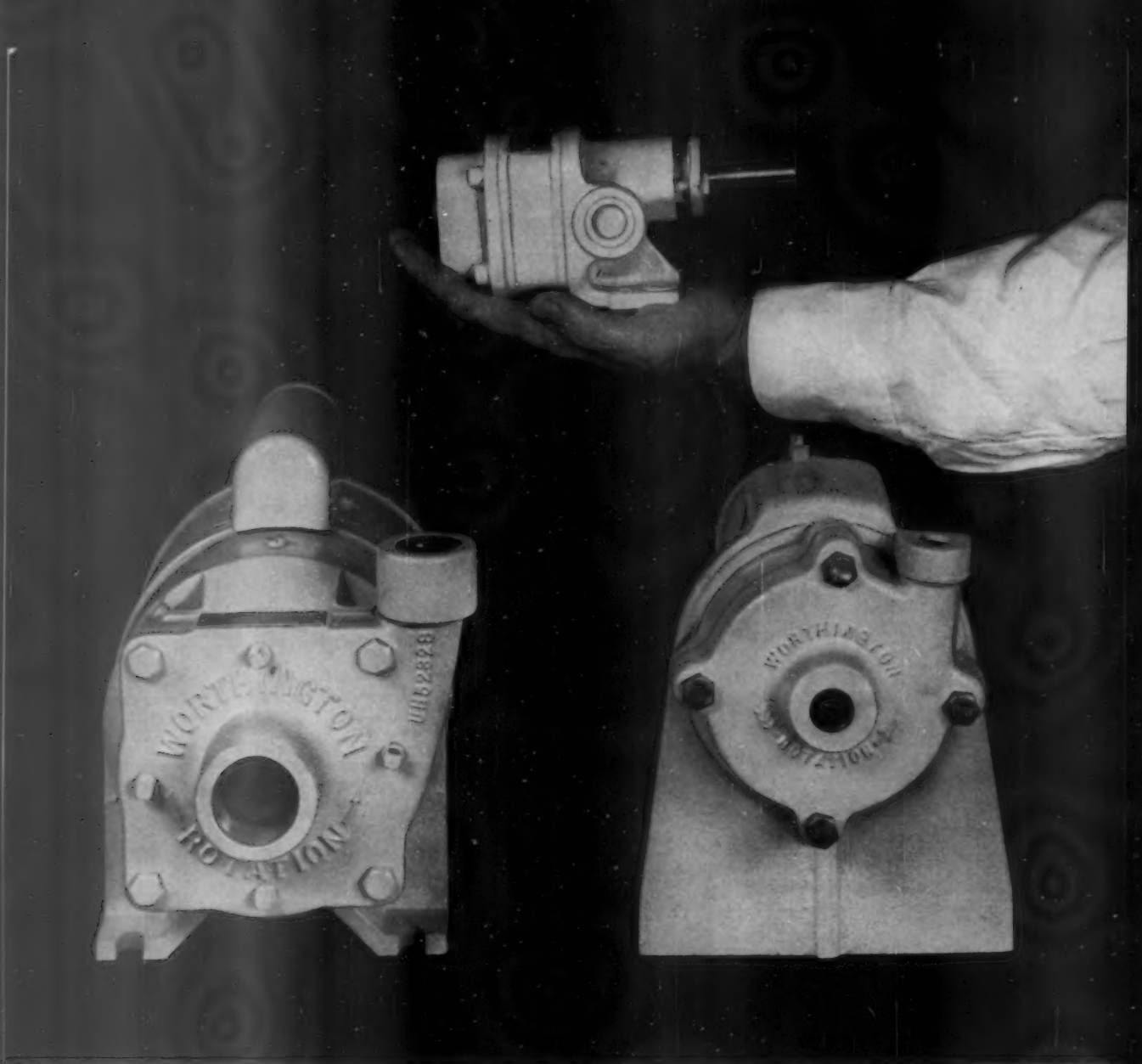


WE'RE BIG IN SMALL PUMPS, TOO

Yes, we're big in small pumps, too . . . so big that we have a complete, separate plant* for their production. But the real proof of how we can meet your small pump needs lies in the extent of our small pump lines. Look how these three new models stretch down to cover many more "small pump" applications.

Look at the new 1″ Centrifugal which efficiently handles small flows from 2 to 80 gpm at heads to 110 feet. It's competitively priced, compact and trouble-free with smoother waterways and higher efficiencies.

Or look at the rotary which performs down to 4 gpm (150 psi) at 1750 rpm. It has one stuffing box to minimize leakage, few moving parts to cut maintenance, excellent suction lift, four-bearing construction, and the herring-bone gears that are quieter and more efficient than spur gears.

For chemical and related industries, there is the new ⅜″ Worthite pump with capacities to 18 gpm and heads to 55 feet. It has all the corrosion-resistant advantages of larger Worthite standard centrifugal pumps.

There are, of course, special advantages in buying small pumps from Worthington. One is that you're getting Worthington "big pump" quality. Another is that the small Worthington pumps are stocked and serviced coast-to-coast. Thus you can standardize in many locations and still get quick pump service anywhere. (Original equipment manufacturers, take note!)

For more information write Worthington Corporation, Section 20-25, Harrison, New Jersey.

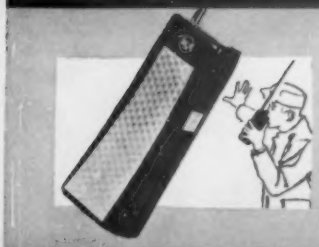
*Located in East Orange, N. J. Our main large-pump plant is in Harrison, N. J.

WORTHINGTON

For more facts Circle 594 on Reader Service Card

Talk Two-Way

- on your job
- in your car
- in your office



PERSONAL-COM 300
Hand-Held 2-Way Radio

Rugged, dependable, fully transistorized 27-megacycle portable 2-way radio, designed specifically for business and industrial uses. Small and light, weighs less than one pound. Has 11-volt mercury battery for 50 hours' operation. Factory-installed plug-in module available to increase transmit power.

MARK VII "Top-of-the-Line"
Citizens' Band 2-Way Radio

Short-range communications facilities for business service and personal needs. Ideally suited for use on materials handling vehicles, or for 2-way conversation between fixed points. Also serves as excellent base station for hand-held radio. 6 or 12 V DC or 115 V AC operation.

LOW-COST INTERCOM

A complete line of quality Intercoms—wired, or wireless—designed for office, factory or home use, at lowest prices. Suitable for many applications, from simple wireless 2-way talk-listen systems to flexible, multi-unit systems with a variety of talk-listen-monitor options.

Send coupon for complete information.

RCA
The Most Trusted Name in Electronics
RADIO CORPORATION OF AMERICA

RADIO CORPORATION OF AMERICA
Special Products Department
Dept. Z-433, Meadow Lands, Pa.

Please send me complete information on the following:

☐ RCA PERSONAL-COM 300
☐ RCA Mark VII ☐ RCA Intercom

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TITLE _____
FIRM OR ORG. _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

280 **Circle 595 on Reader Service Card**

BELT SPEEDS SET QUICKLY, CHECKED ACCURATELY, WITH METRON TACHOMETERS

Did you know that Metron tachometers can be calibrated to read not only RPM, but also linear measurements, FPM or IPM, or directly in production-units-per-time-period?

A great many of our highly accurate yet low-priced tachometers are shipped regularly with such calibration.

Write today for full information on how Metron portable and fixed tachometers can simplify your web and roll measurements.

Metron

METRON INSTRUMENT CO.
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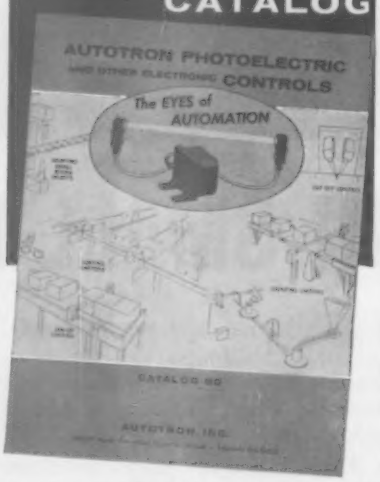
NEW PHOTOELECTRIC CATALOG



Describes wide selection of heavy duty industrial photoelectric equipment including transistorized and conventional controls with light sources and remote heads for all kinds of applications. Also large selection of simplified diagrams covering widely varied applications. Send for your copy today.

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- ★ Home of deep-water Port Everglades
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Your inquiries held in strict confidence and answered in full detail

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CHAMBER OF COMMERCE
HOLLYWOOD, FLORIDA

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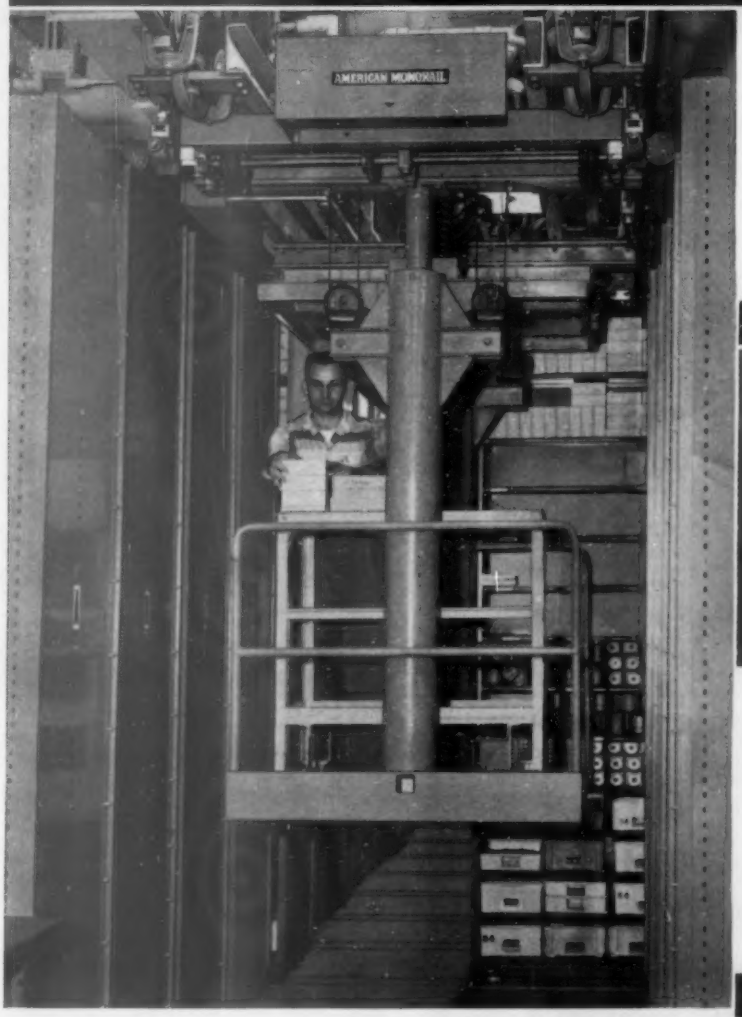
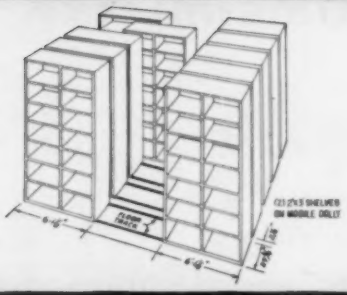
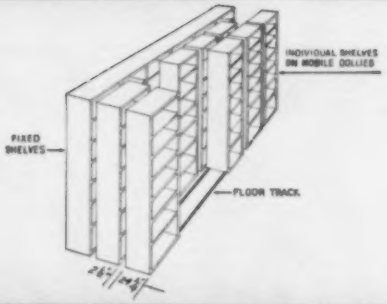
LOOK MA....NO AISLES!





ACTIVE STORE ROOM



INACTIVE STORE ROOM

An American Monorail carrier plus mobile shelves added 7,500 sq. ft. of usable storage space to a Pennsylvania plant.

Ten foot high shelving units equipped with grooved wheel dollies ride on double rails mounted flush to the floor. Shelf units roll out into the aisle smoothly with a pull equal to 1% of their total weight. The Monorail carrier, used for loading and unloading shelves, has a photo cell safety device that prevents running into a shelf unit.

Major Benefits: Stock stays cleaner and the amount of space required for aisles is cut in half.

Free Folder — pictures and describes stacking by specialized American Monorail Stackers in many types of warehouses. Write for Bulletin SB-1.

ENGINEERED MATERIALS HANDLING

1114 EAST 200th STREET CLEVELAND 17, OHIO

AMERICAN MONORAIL

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DIVISIONS: Conveyor Division, Tipp City, Ohio — Canadian Monorail Co., Ltd., Brampton, Ont.

- *Latest mechanical features*
- *Newest techniques in manufacture*
- *Most advanced high strength materials*

PRIME-MOVER PALLET TRUCK

Prime-Mover Pallet Trucks represent the latest engineering design—most efficient production techniques—strongest modern materials. Fewer and stronger parts mean longer, trouble-free, dependable service and performance.

The sealed hydraulic system is precision machined with ground finishes to maintain positive, leak-proof operations. All wear points are cast and machined rather than formed or stamped. Up-dated and made to traditional PRIME-MOVER high standards.

MODEL P-25

$359

MADE IN TWO SIZES:
2500 lb. capacity, Model P-25
4500 lb. capacity, Model P-45

Available in 20½ and 27 inch widths; in 36, 42, 48 inch fork lifts. Model P-25 costs only $359; Model P-45 costs only $395.

Manufactured in Muscatine, Iowa by the PRIME-MOVER CO. and sold by leading material handling equipment dealers throughout the country.

PRIME-MOVER

For more facts Circle 600 on Reader Service Card

AJAX ability to handle angular and offset misalignment totaling 7 degrees and more is preventing breakdowns, relaxing production tolerances, cutting assembly and maintenance costs. *Write for catalog.*

AJAX FLEXIBLE COUPLING CO. INC.

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Incorporated 1920 ***Representatives in Principal Cities***

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BOOK NEWS

TOTAL QUALITY CONTROL:
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Just Published. Fully discusses the activity of controlling quality of products in industry as it extends throughout the entire business system. Determination of customer wants and needs and interpreting these factors in the form of a design, conforming to the design during production, follow-up on field performance and feeding back of quality information to further improve the quality system are explained comprehensively. Covers engineering technologies used in quality control work. **By A. V. Feigenbaum, Gen. Electric Co. 627 pp., over 230 illus., $11.00.**

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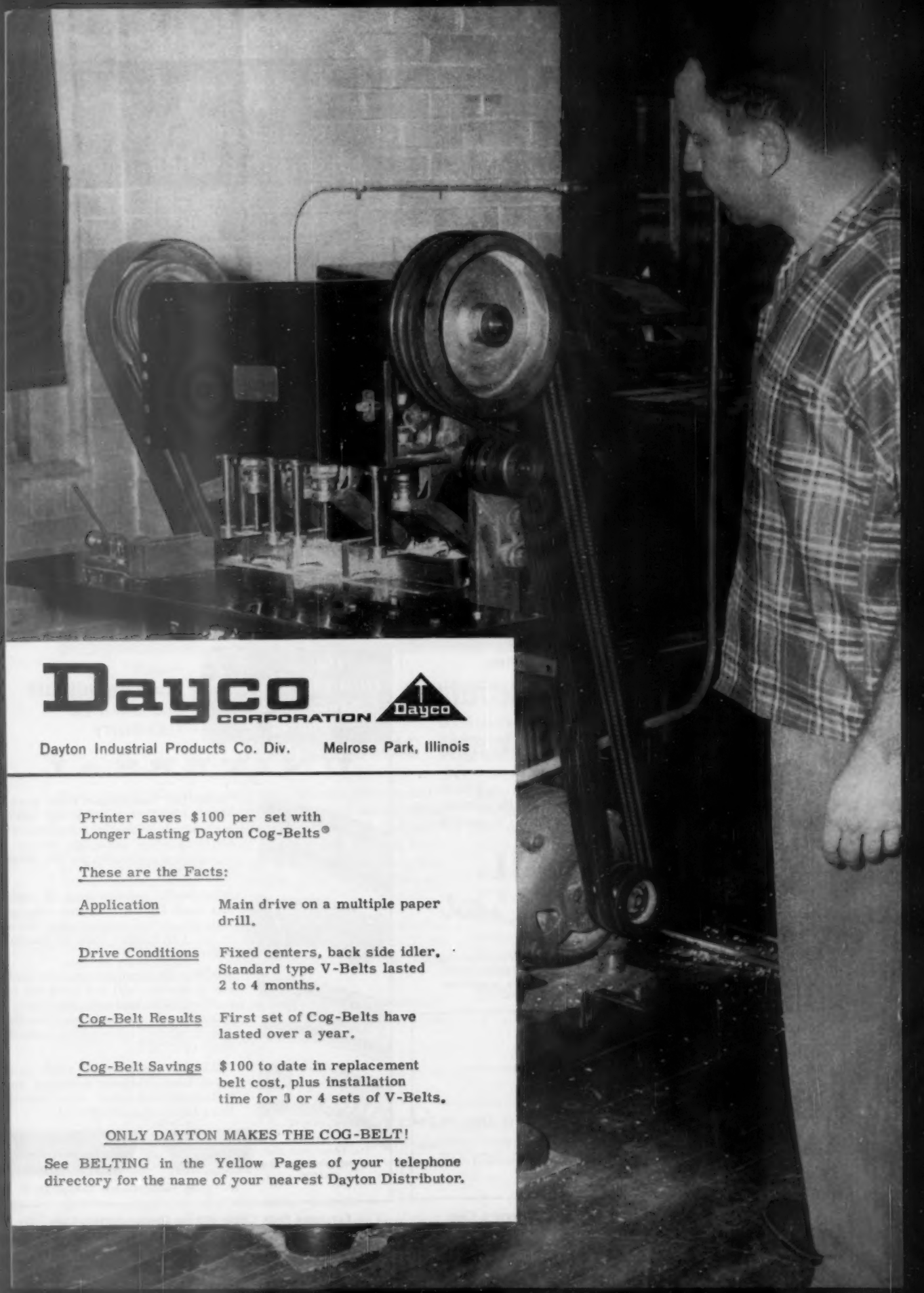


Dayco CORPORATION

Dayton Industrial Products Co. Div. Melrose Park, Illinois

Printer saves $100 per set with
Longer Lasting Dayton Cog-Belts®

These are the Facts:

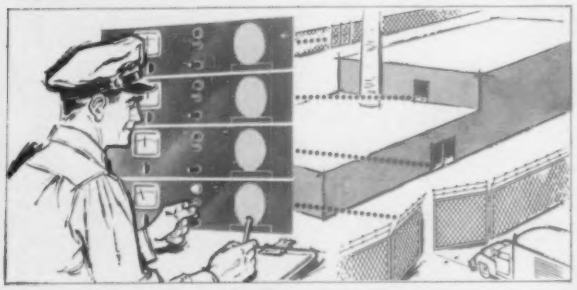
Application	Main drive on a multiple paper drill.
Drive Conditions	Fixed centers, back side idler. Standard type V-Belts lasted 2 to 4 months.
Cog-Belt Results	First set of Cog-Belts have lasted over a year.
Cog-Belt Savings	$100 to date in replacement belt cost, plus installation time for 3 or 4 sets of V-Belts.

ONLY DAYTON MAKES THE COG-BELT!

See BELTING in the Yellow Pages of your telephone directory for the name of your nearest Dayton Distributor.

CUT PLANT PROTECTION OVERHEAD!

Now just one man, two wires, and Honeywell controls can tend your doors and gates



Stationed at a control panel, one centrally-located man or your telephone operator can control traffic at any door or gate safeguarded by Honeywell.

Located up to four miles away, *one man* . . .

- can determine the position of any door or gate and open or close it automatically.
- can determine the presence of anyone, at any time, and permit admittance of employees, authorized visitors and deliveries.
- can talk to anyone at a controlled entrance over a two-way communications system.

If positive, visual identification is required, closed-circuit TV can be added later.

Honeywell's door and gate control costs as little as $600. Many plants report that the system pays for itself in less than one year! For more detailed information on how you can save with Honeywell's door and gate control, call your nearest Honeywell office. Or send the coupon below. *Sales and service offices in all principal cities of the world.*

Honeywell

First in Control

SINCE 1885

Door and gate controls are just one of Honeywell's practical and proven security and equipment monitoring systems. Others: central control panels, electronic fences, local annunciators, power supplies and systems for sonic motion and fire detection.

MINNEAPOLIS-HONEYWELL
Dept. FM-9-163, Minneapolis 8, Minnesota

Please rush information on your low-cost door and gate control.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

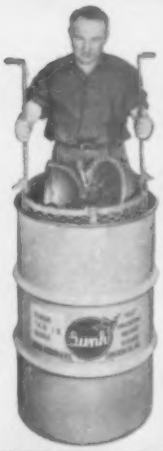
284 For more facts Circle 603 on Reader Service Card

GUNK® Hydro-Seal

economically strips paint from production rejects!

. . . eliminates hazard and expense of stripping paint with hot, caustic solutions — Gunk H.S. is *safe on all* metals. Just dunk; rinse with water. Available in open-head drums, with or without baskets; ideal for low-cost *cold immersion* process paint stripping . . . Removes grease and carbon too! Write for full details, *today*.

® Reg. trade mark



GUNK LABORATORIES, INC.

Gunk Chicago Co., River Forest, Illinois serving the Midwest and Southwest

Radiator Specialty Co., Charlotte, No. Carolina serving the East, Southeast and Far West

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The ALL-METAL *Flexible* EXHAUST and BLOWER TUBING

—with PLUS SERVICE LIFE and GREATER FLEXIBILITY

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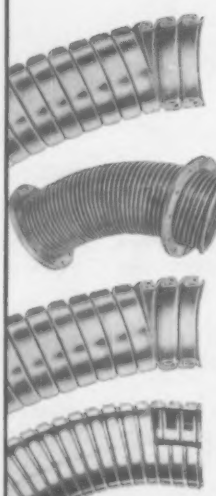

"STEELFLEX" (galvanized steel) available in standard weight grade, light, medium, heavyweight and superweight grades, unpacked, copper-wire packed or asbestos packed. Sizes to 16" I.D.

"COROFLEX" (carbon steel or stainless steel) for diesel engine exhaust installations in confined areas. Sizes to 10" I.D. Larger sizes on special order.

"NICROFLEX" (stainless steel) for high temperatures—will not burn out or rust out. Standard and light heavyweight unpacked—light heavyweight also available copper-wire packed. Sizes to 12" I.D.

"EASYFLO" (galvanized steel) conveyor hose—abrasion resistant. Interlocked construction with Smooth Bore Liner. Sizes to 12" I.D.

Request IPB Sec. 3A(a) Price List and complete Catalog ID-100E

QUALITY... Factory Assembled and Tested ...for Flexible Hose Products

Universal METAL HOSE CO.

2147 South Kedzie Avenue, Chicago 23, Ill.

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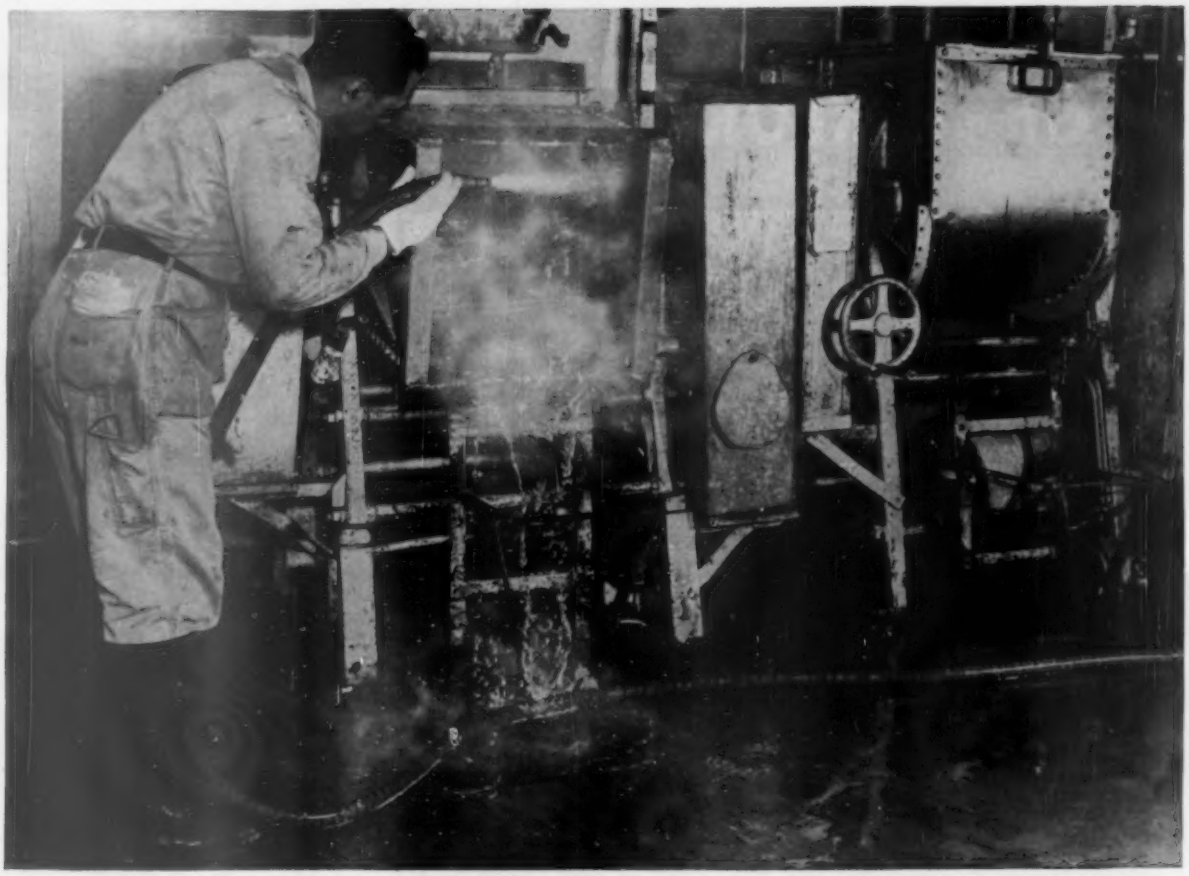


NOW...a corrosion resistant floor topping that withstands thermal shock

Penntrowel® Flextherm is a new resinous cement coating with excellent resistance to thermal shock from steam, hot water and radiant heat. It is particularly useful for protecting floors and walls in dairies, food plants, breweries and packing houses where steam, hot water, strong acids and alkalis cause rapid deterioration of ordinary concrete.

Rugged: 4 to 6 times the abrasion resistance of concrete. Resists both continuous heat and thermal shock . . . as well as most alkalis, dilute acids, solvents, oils, fats, milk products and blood.

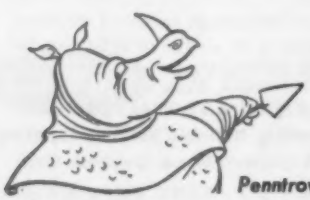
Economical: Long life expectancy cuts maintenance costs. Saves material and labor costs; only ¼-inch topping is required for most installations.

Easy To Use: Penntrowel Flextherm bonds to many surfaces, including concrete, brick and metals. Applied by trowel or spray, it requires only a clean, sound subsurface. It cures overnight at room temperatures.

Penntrowel Flextherm is available in tile red, green, or neutral.

Other Pennsalt industrial floor surfacing materials include: Penntrowel Latex for high resiliency, resistance to impact . . . Penntrowel Floor Surfacer for heavy vehicle traffic . . . Special Penntrowel for exposure to fluorides . . . Pennsalt Joint Filler . . . pouring grade.

Write today for CP-679 . . .
our new data sheet on Penntrowel Flextherm.



PENNSALT CHEMICALS CORPORATION
Corrosion Engineering Products Dept. • Natrona, Pa.
Manufactured in Canada by G. F. Sterne & Sons Ltd., Brantford, Ont.

Penntrowel — Rugged as a Rhino

Pennsalt Chemicals
ESTABLISHED 1850

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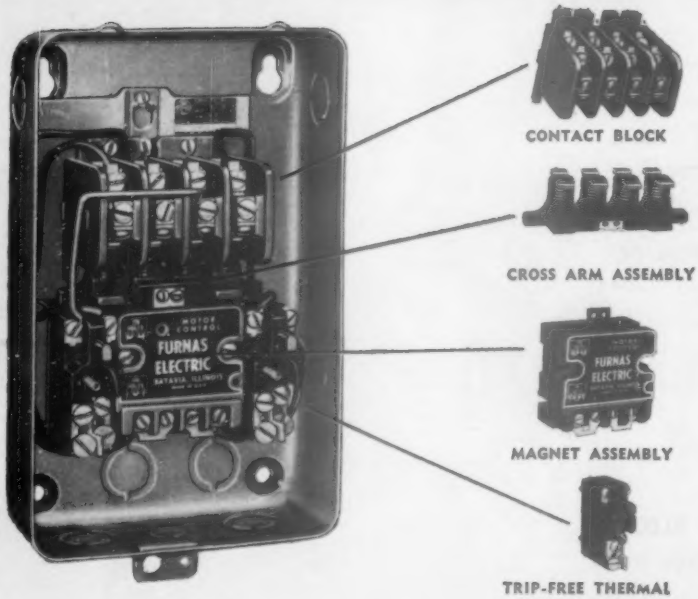

The highest quality means the best control! Furnas Electric components, with their "years ahead" design and top quality materials, assure you of top performance and longer control life.

CONTACT BLOCK—non-tracking, fungus and moisture-resistant. Made of impact-resistant material to withstand severe usage. Deep arc chambers prevent arcing.

CROSS ARM ASSEMBLY—of high-impact material for millions of operations. Stainless steel contact springs. Visible and front removable silver-cadmium oxide contacts.

MAGNET ASSEMBLY—dual voltage—dual frequency coils, 110-220 or 220-440 volts. Magnet features just one moving part. Layer wound encapsulated coil with built-in terminal board. Coils are built to withstand moisture, fungus and combustion.

TRULY TRIP-FREE THERMAL OVERLOAD RELAY—
—manual or automatic reset. Non-adjustable trip assures tamper-proof operation. Third overload kit can be added in the field.

A106

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GEMAR ASSOCIATES, INC.
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CARRIER GAS-FIRED DUCT FURNACES AND UNIT HEATERS

...built for peak performance at low operating cost!

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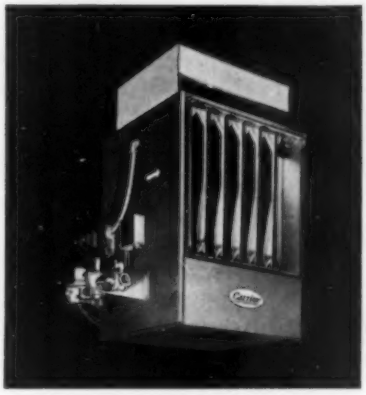
Whether used as main heat source or booster heaters for central air distribution systems, as independent heaters with matching blower unit, or in combination with many types of air conditioning systems, there are any number of arrangements to fit specific applications. A full line of open and encased blowers is available with each size furnace.



46W UNIT HEATERS. Capacities—from 30,000 to 300,000 Btuh. AGA approved. Carrier Unit Heaters include as standard equipment many features unobtainable in so-called economy models, or offered only as "optional accessories" on many standard models. These quality features are standard on all sizes—and result in quiet, low-cost operation. Units are finished in durable gray baked enamel for attractive appearance and long life.

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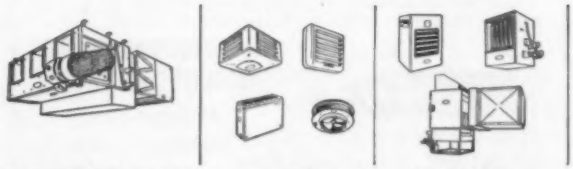
Whatever the application, there's a Carrier Furnace or Unit Heater to handle the job to your satisfaction. For information, call the Carrier representative listed in the Yellow Pages under "Heaters—Unit." Or write Carrier Air Conditioning Company, Syracuse 1, New York.

Carrier offers every type of equipment for any job

Carrier **Air Conditioning Company**



Heating and Ventilating Units for steam and hot water | Unit Heaters for steam and hot water | Gas Unit Heaters and Duct Furnaces

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WHO USES Rubbair® the true door . . not a curtain Doors?

A Rubbair Door installation at the warehouse of S. Kann & Sons Company, Hyattsville, Maryland

THE S. KANN SONS CO.
Washington, D. C.

READ THIS ACTUAL CASE HISTORY . . .

In response to your letter of March 25, we are happy to inform you that we are very pleased with the Rubbair Doors that were installed about 3 years ago in our warehouse at 5620 Ager Rd., W. Hyattsville, Md. They have held up well and have satisfactorily performed their function of keeping cold air out of the building while allowing easy passage of merchandise through the doorways. If we were to build a new warehouse, we would duplicate the Rubbair door installation.

Sincerely yours,
B. B. Bergunder, Jr.
Vice President

RUBBAIR DOORS flex on impact because of their construction. They absorb high traffic punishment from the constant pounding of fork trucks, material handling equipment, packing boxes and cases. The 'flex' and 'bounce' features of RUBBAIR DOORS give you longer, factory-tested door life and extremely low maintenance costs.

RUBBAIR DOORS assure trouble free operation with . . .

- **Flexible Construction**
- **Rugged V-Cam Hinges**
- **Scuff-resistant Wear Panels**
- **Shatter-proof Windows**
- **Safety Cushion Nose**
- **Positive Air Seals**

If you have an industrial or warehouse door problem, let us help you solve it. Write us about it, or send for free catalog.

Stic-Klip®

MANUFACTURING CO. INC.
RUBBAIR® DOOR DIVISION
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protection by the roll

- Protect machined surfaces in handling — reduce rejects
- Save finishes and plating
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- Remove easily, cleanly
- Types for every purpose — waterproof, non-staining, printable, high strength, high temperature.

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Dr. Scholl's Adhesive Tape Division

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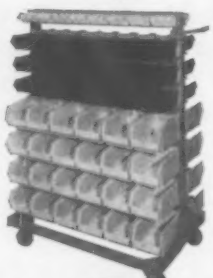
Lewis UNITIZED ASSEMBLY CONTAINERS

FOR
- **ASSEMBLY**
- **PRODUCTION**
- **STORAGE**

Lewis Plastibox containers are one-piece molded plastic. They are smooth, strong, non-corrosive, easily cleaned. Colors, either green or yellow, are molded-in. Plastibox containers stack securely and afford maximum storage of small parts. Sizes available are 8½" long x 5" wide x 4½" deep, 6" x 3½" x 2½", 3" x 3½" x 1¾", and 3" x 3½" x 1¾" with a vertical divider.



MOUNTING RAILS — Rails are supplied in 18" and 36" lengths to mount 4 or 8 of the 3 smaller size Plastibox containers; 3 or 6 of the largest size. Rails afford a wide variety of bench or wall arrangements for any assembly or storage operation.

MOBILE TRUCK ASSEMBLY — These Lewis trucks handle all sizes of Plastibox containers and allow the boxes to be quickly and easily moved from one area to another. Trucks furnished with 36" mounting rails, two swivel and two rigid casters, and are finished in grey enamel.

WRITE TODAY
for complete information and brochure

G.B. Lewis COMPANY
129 Montgomery St. · Watertown, Wisconsin

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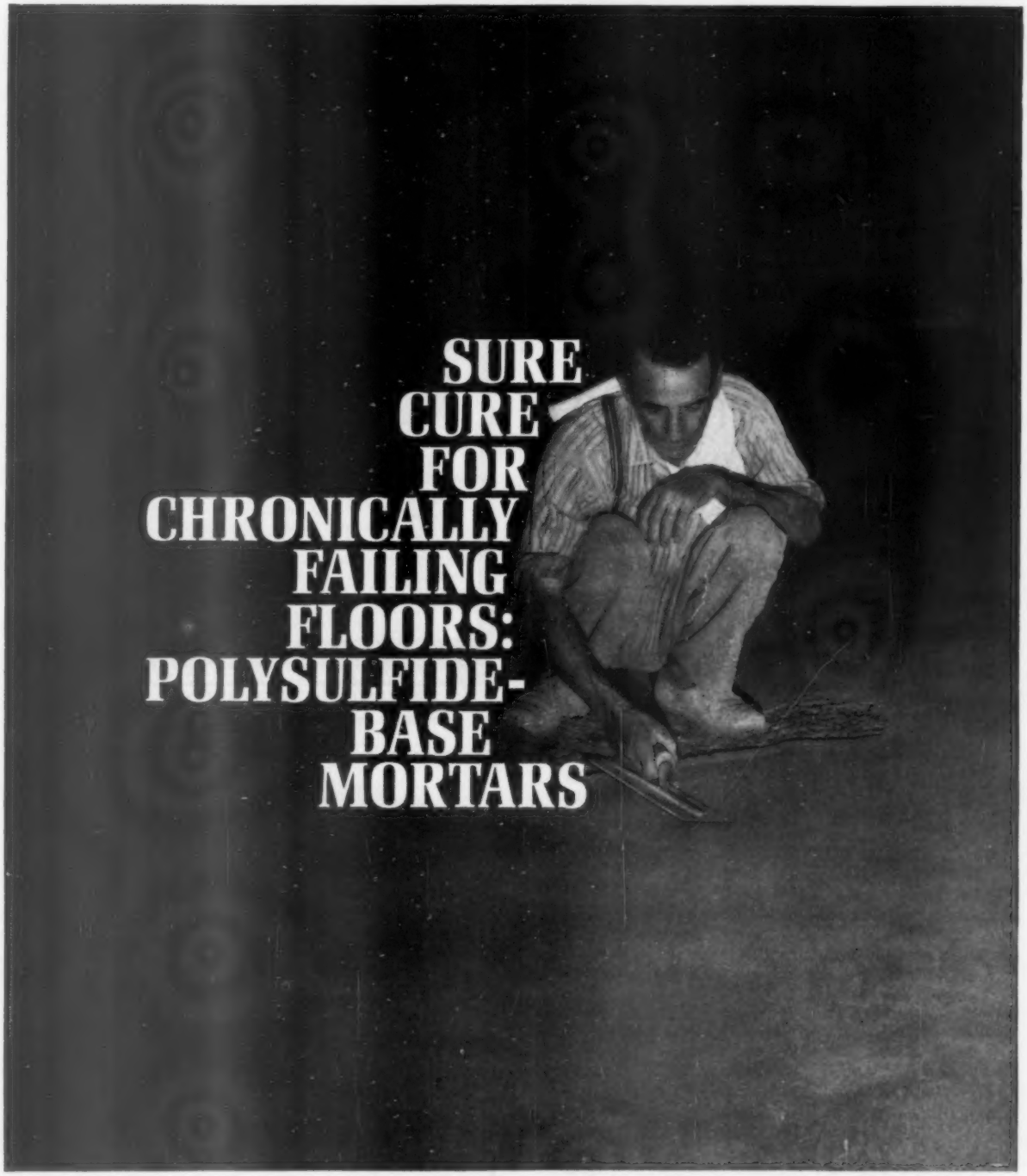

In more and more industrial buildings where manufacturing processes have raised havoc with conventional floors and have caused a continuing cycle of restoration, THIOKOL polysulfide-base flooring compounds are delivering long trouble-free service and decreasing maintenance costs.

THIOKOL polysulfide polymer is synthetic rubber in liquid form. It is famous for spectacular adhesion, elasticity, and resistance to oils, solvents, acids, chemicals, water and temperature extremes. As a mortar base with epoxy, it stands up to heavy traffic, abrasion, chemical attack like no other flooring compound. It can be applied over existing surfaces regardless of their composition, and has proven its serviceability in scores of installations.

Polysulfide-base mortars provide a smooth or skidproof surface, as desired—are ready for traffic in less than one day—and last for years under abusive wear and exposure to disintegrating elements. For full information, write to Thiokol Chemical Corporation at address below, for Brochure FC-100.

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In Canada: Naugatuck Chemicals Division, Dominion Rubber Company, Elmira, Ontario

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BID OPENING DATE
Nov. 1, 1961

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164-ACRE

Production-Ready

MANUFACTURING FACILITY

(former Naval Ordnance Plant, Pocatello, Idaho)

To be sold in its entirety or as 6 separate parcels, with or without machinery and equipment.

This site offers outstanding opportunities for manufacturing, "industrial park" development or other applications.

LOCATION – In Pocatello, Idaho, on US Highway 30 at major junction of Union Pacific, served by two airlines, for swift connections to Pacific ports and major cities throughout the Nation. Half a day from Yellowstone, 90 minutes from mountains for scenic beauty and year-round recreation. Home of Idaho State College.

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FREE BROCHURE details all features, outlines parceling and gives bid procedures. A complete inventory of facilities, machinery and equipment is available at the site or at the GSA Administration Bldg., Auburn, Washington.

Sealed bids for the purchase of the property will be received at Room 101, Federal Office Building, 909 First Avenue, Seattle 4, Washington, until 11:00 a.m. PST, November 1, 1961, then publicly opened and read. Bids must be submitted on forms provided by GSA. Bid forms, instructions to bidders, and Terms and Conditions of Sale are available from the above address or from:

GENERAL SERVICES ADMINISTRATION
Region No. 10—Administration Bldg.—Auburn, Washington

General information on GSA policy, procedures and bidding requirements with respect to this sale or sales of other Government property may be obtained by calling or writing the GSA regional office nearest to you in Boston, New York, Washington D. C., Atlanta, Dallas, Kansas City, Chicago, Denver, San Francisco, or Auburn.

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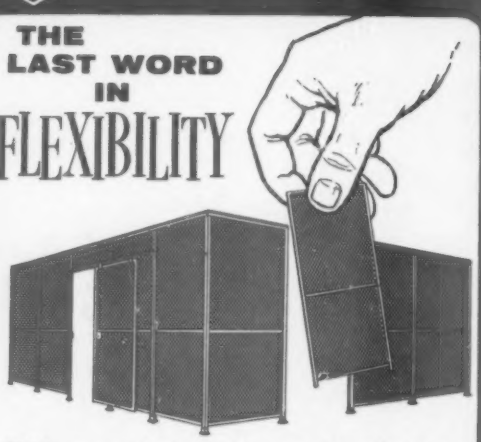
THE LAST WORD IN FLEXIBILITY



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You save time . . . you save money . . . you save manpower —with Anaconda butyl-insulated Duralox.* *For Duralox has its own conduit of durable, yet flexible, metallic armor.*

This means fast and easy installation in long runs over and around obstructions, in trays, indoors or out—and all without the expense, trouble and time of laying rigid conduit and pulling cable through it.

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Whether your problem is wiring a new plant or rewiring an old one—see the Man from Anaconda. Duralox is just one of the many types of Anaconda wire and cable that can help you increase plant flexibility . . . reduce operating costs . . . bring in new power for your needs today and tomorrow. For full information on Anaconda Duralox Cable write for Bulletin DM-5606 to: Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

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Duralox has Anaconda Butyl (AB) rubber insulation
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For all-'round deodorizing

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Dependable DOLGE WESTPORT, CONNECTICUT

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FLINTKOTE®

America's Broadest Line of Building Products

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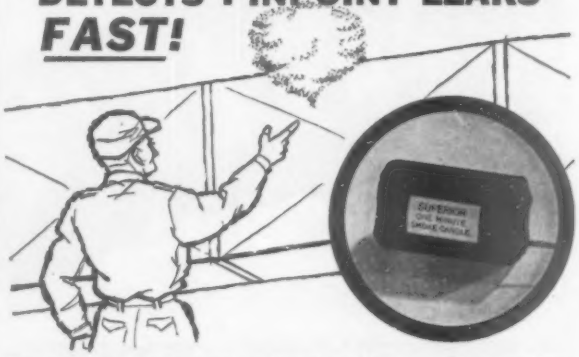
DETECTS PINPOINT LEAKS *FAST!*



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Superior SIGNAL COMPANY, INC.

Dept. F-1 6 Colfax St., South River, N. J.

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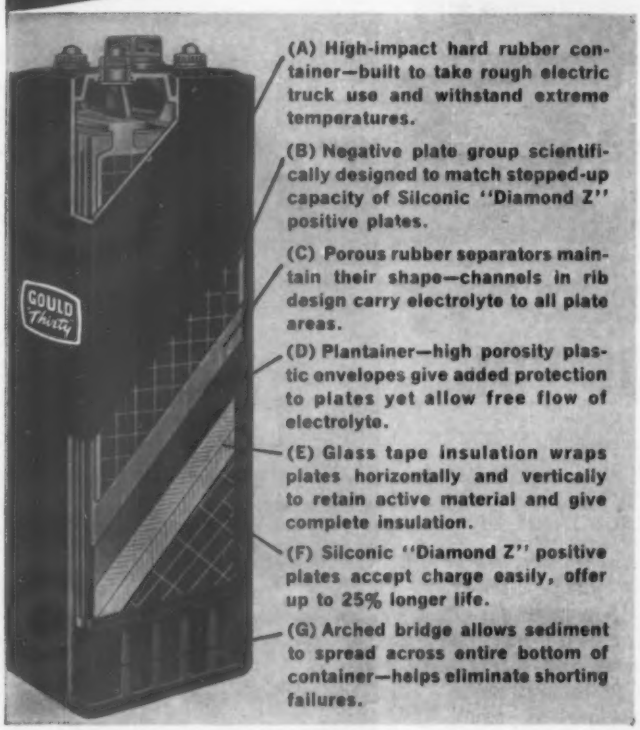

(A) High-impact hard rubber container—built to take rough electric truck use and withstand extreme temperatures.

(B) Negative plate group scientifically designed to match stepped-up capacity of Silconic "Diamond Z" positive plates.

(C) Porous rubber separators maintain their shape—channels in rib design carry electrolyte to all plate areas.

(D) Plantainer—high porosity plastic envelopes give added protection to plates yet allow free flow of electrolyte.

(E) Glass tape insulation wraps plates horizontally and vertically to retain active material and give complete insulation.

(F) Silconic "Diamond Z" positive plates accept charge easily, offer up to 25% longer life.

(G) Arched bridge allows sediment to spread across entire bottom of container—helps eliminate shorting failures.

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A complete line is stocked nationwide for fast delivery, and Gould field engineers are located in all parts of the country to assist you in battery application and maintenance procedures. For more information, write or call your local Gould representative. Sales offices and agents in continental United States and overseas.

A complete line of charging equipment available. Ask for free catalog.

More Power to you from GOULD

GOULD-NATIONAL GN BATTERIES, INC.

INDUSTRIAL BATTERY DIVISION

GOULD-NATIONAL BATTERIES, INC.

St. Paul 1, Minnesota

If we don't stock the plier-type tool you need

we'll make it for you

Using an exclusive cost-saving system of matched components, Sargent will design and build the plier-type tool you need for production, product installation, or maintenance. Sargent "Specials" cut, crimp, hold, shape, or perform a dozen other operations.

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For additional facts send for Sargent's Hand Tool Catalog and Case History book. Write: Sargent & Company, Hand Tool Division, New Haven 9, Connecticut

hand tool division
SARGENT

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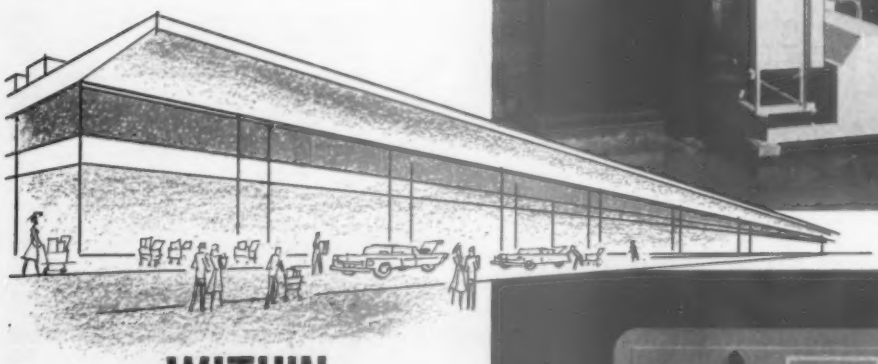

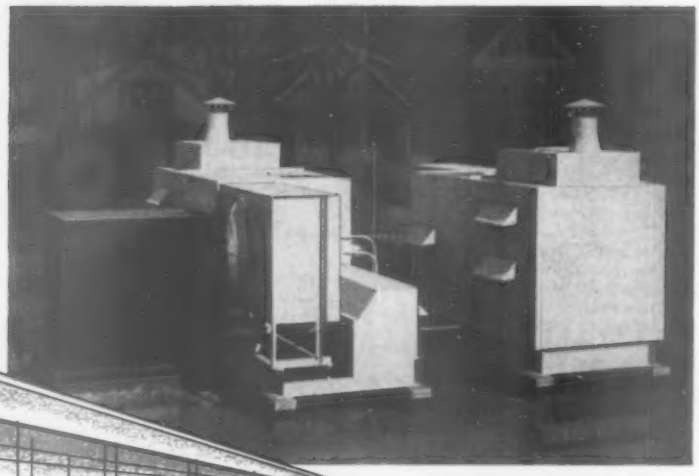

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1—Elevated flooring
2—Small metal buildings
3—Ceiling panels
4—Steel buildings

MAINTENANCE
5—Lubrication equipment
6—Cleaning system
7—Precipitators
8—Gloves
9—Dust filter

ELECTRICAL
10—Capacitor
11—Controlled motor speed
12—Infra-red heating
13—Miniature pushbuttons
14—Transite conduit
15—Wiring raceways
16—Rectifiers

PRODUCTION
17—Machine tools
18—Machine tool controls
19—Tools
20—Meters
21—Tools
22—Mixers
23—Process material handling

INSTRUMENTS AND CONTROLS
24—Testing instruments
25—Gauges
26—Temperature regulator
27—Testing machines
28—Microhardness tester
29—Metal detectors

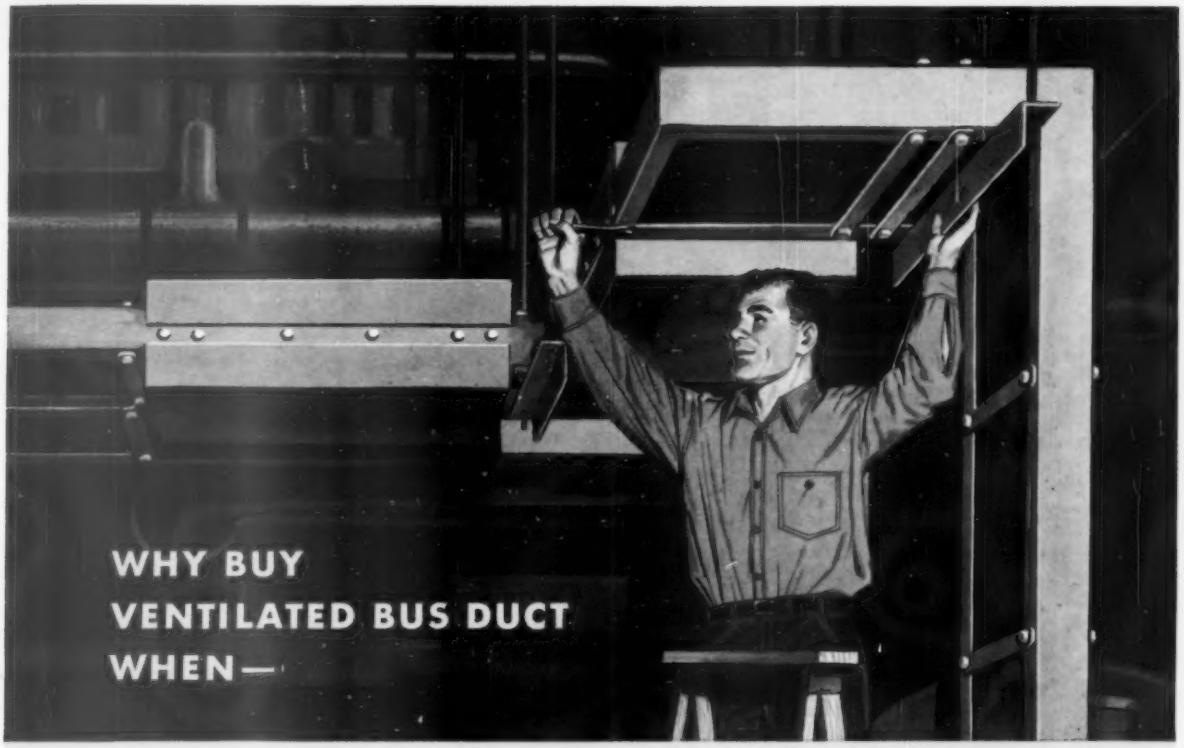
MATERIAL HANDLING
30—Electric lift trucks
31—Powered conveyors
32—Floor trucks
33—Vibrating screens
34—Remote handling system
35—Handling equipment
36—Storage racks
37—Automation accessories

AUXILIARY
38—Fans, air washers
39—Blowers
40—Air compressors
41—Fans, blowers
42—Ventilators, heaters
43—Air-moving equipment
44—Roof ventilators
45—Roof fan, inducer, blower
46—Air systems

MECHANICAL
47—Speed reducer
48—Seals, fasteners
49—Coupling adapters
50—Variable speed drives
51—Couplings
52—Air, hydraulic cylinders

PIPES, VALVES AND FITTINGS
53—Control valves
54—Needle valves
55—Safety heads
56—Air valves
57—Strainers
58—Plastic tubing

PLANT SITES
59—Pennsylvania
60—Tennessee
61—Michigan



Square D TOTALLY ENCLOSED Duct*
mounts in any position without de-rating
—*and costs no more*

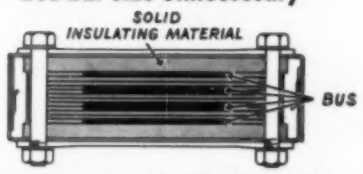
*(low impedance)

Square D totally enclosed low-impedance bus duct mounts in any position without de-rating, because it doesn't need ventilation. Moreover, you can have all the advantages of totally enclosed duct without the price penalty of a "special," because all Square D low-impedance bus duct is totally enclosed. Square D feed-in duct has no ventilation holes, is protected from physical damage and dust accumulation. It's smaller than ventilated duct by as much as 50%. Doesn't it make sense, when buying low-impedance duct, to specify a product that meets every one of your requirements? Square D totally enclosed low-impedance duct costs no more —why settle for less?

Here's Why Square D's

EXCLUSIVE Design

makes ventilation and increased bus bar size unnecessary



The entire space within the duct and between the bus bars is filled with a solid insulating material which conducts the heat to the surface. There are no dead air spaces inside the duct. Square D totally enclosed low-impedance duct meets U/L requirements for temperature rise with no larger bus bars (hence, no higher cost) than ventilated duct.

SQUARE D COMPANY

wherever electricity is distributed and controlled

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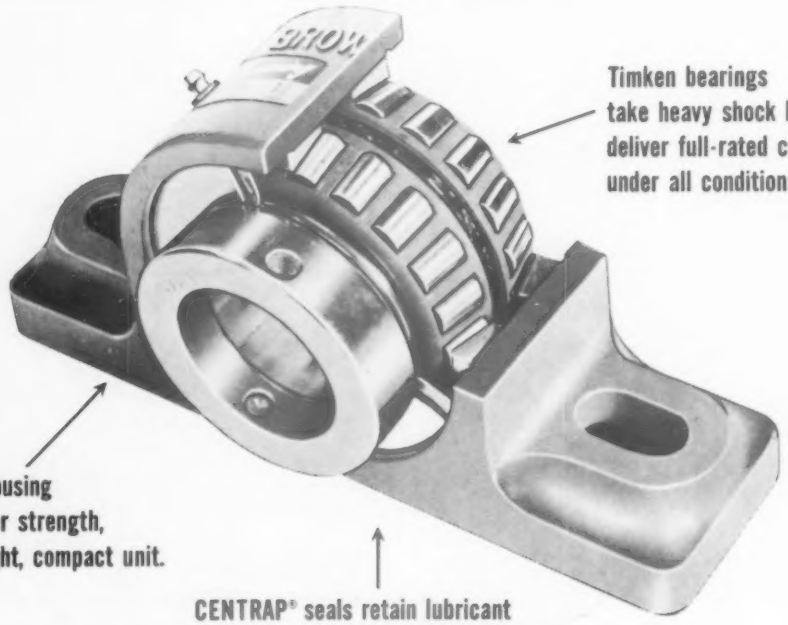
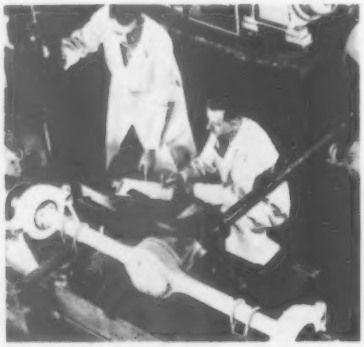
Browning malleable housings team up with Timken® bearings for greater capacity and strength



To be sure their PB900 pillow block has maximum ability to take heavy loads, Browning Manufacturing Company, Maysville, Kentucky, uses a malleable housing and Timken® tapered roller bearings. The malleable housing permits a stronger yet lighter, more compact unit. The Timken bearings provide higher load-carrying capacity and longer life in minimum space—more than any other type of bearing.

It's the tapered design of Timken bearings that enables them to take *both* radial and thrust loads. Full-line contact between rollers and races and precision manufacture give Timken bearings *extra* load-carrying capacity. And they're made from the finest bearing-quality alloy steel available to withstand shock.

OUR ON-THE-SPOT ENGINEERING SERVICE saves customers time and trouble. Our graduate engineer salesmen help you select the most economical bearing for your job.



TESTING FACILITIES in our modern laboratories help us solve customer bearing problems—develop new bearings just as we did for Browning Manufacturing Company.

Industry rolls on

TIMKEN®

tapered roller bearings

The Timken Roller Bearing Company, Canton 6, Ohio. Cable: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits. Canadian Division: Canadian Timken, St. Thomas, Ontario.

For more facts circle 406 on READER SERVICE CARD